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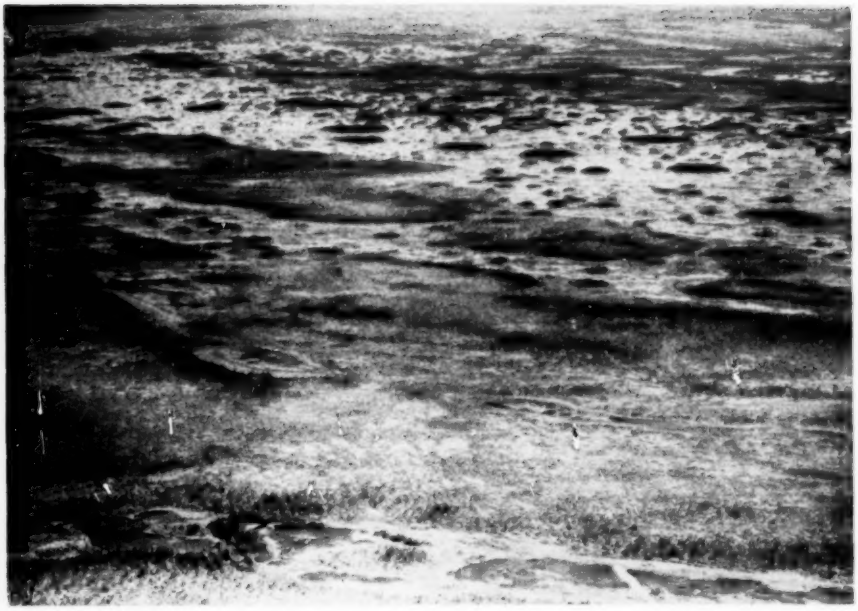

FIG. 1. Muskeg about 27 miles north of the Albany River and about 45 miles inland from James Bay, Ontario.

FIG. 2. Open muskeg in the vicinity of the dancing ground.

MUSKEG AS SHARP-TAILED GROUSE HABITAT

BY HAROLD C. HANSON

IN their review paper on the ecology and distribution of the Sharp-tailed Grouse, *Pedioecetes phasianellus*, the Hamerstroms (1951) pointed out that little is known about the life history and ecology of the northern races (*caurus*, *kennicottii*, and *phasianellus*). In 1947, while investigating the Canada Goose in the extensive muskeg country west and south of Hudson Bay and James Bay, I had opportunity to study briefly a dancing ground of the race *phasianellus*. The nature of this dancing ground was so different from the commonly known types that it appeared to offer at least a partial explanation as to how this race has been able to adapt itself to a muskeg environment. While only one dancing ground was found, it is difficult to believe that the specialized habits of the one group of breeding birds observed are not common to other flocks of the region. Other general conclusions presented here are based on extensive low altitude flights, both in 1947 and again in 1949, numerous penetrations of the muskeg on foot, and a fairly extensive plant collection made in the region.

For support of field operations while in the James Bay-Hudson Bay region, I am happy again to acknowledge grants by the Arctic Institute of North America and Ducks Unlimited, which made the work possible. The manuscript was improved by the helpful criticism and suggestions given by Ralph E. Yeatter and Frederick and Frances Hamerstrom.

The range of the Sharp-tailed Grouse extends from central western Quebec west to Alaska and south to northern California, Utah, southwestern Colorado and central Wisconsin. Such a widespread species, which is not migratory in the usual sense of the word, must of necessity be sufficiently adaptable to meet its requirements in the diversified habitats found in such an extensive range. Some adaptations have probably become genetically fixed, a consequence which at least in part is likely to be paralleled by phenotypical differences (Mayr, 1950). At present six subspecies of Sharp-tailed Grouse are recognized.

The habits of the race *campestris* in Wisconsin best serve as a standard upon which to evaluate the Ontario observations. In early settlement times the sharp-tails of the southern Wisconsin prairies showed a preference for oak openings (Schorger, 1944); its original range within the forested portions of central and northern Wisconsin is believed to have been in and around edges of open bogs and marshes and on burns (Hamerstrom *et al.*, 1952). The observations made by me in northern Ontario in 1947 indicate that the designation of open bogs as an important original sharp-tail habitat in Wisconsin is undoubtedly correct. Because knowledge of the northern

races of Sharp-tailed Grouse has been so scanty, it does not appear to have been fully realized that muskeg apparently constitutes one of the primary habitats in the range of the nominate race, *phasianellus*, which breeds south of the timberline on both sides of Hudson Bay and James Bay from central western Quebec west to northeastern Manitoba south to about the Canadian National Transcontinental Railway in Ontario (Hellmayr and Conover, 1942; Snyder, 1935). The Sharp-tailed Grouse has been reported from all major sectors of the Hudson Bay lowlands or the "Great Muskeg," in some years being particularly abundant (Manning, 1952).

Snyder (1935) stated that the race *phasianellus* "in habits and behavior, is still an open-country bird; it still attempts to be a 'prairie dweller' in the openings of the forest in the north. But in such an area they must be rather irregularly established here and there in suitable habitats, which are more or less restricted locally and *definitely hemmed in by the flanking forest*" (italics mine). With more information available on the ecology of the "Great Muskeg" of northern Ontario, the above statements can now be modified considerably insofar as they apply to the District of Patricia.

Snyder's Map 1 (1935) indicates that the eruption and subsequent emigration of sharp-tails in 1932 occurred from the region south and west of James Bay and Hudson Bay, an area which coincides (without its western limits being delineated) almost exactly with the limits of the lower two-thirds of the Palaeozoic Basin. The latter, more commonly referred to as the Hudson Bay Lowlands (Anon., 1947), constitutes a 125,000 square mile area which supports, almost equivalent in size, perhaps the single greatest continuous tract of muskeg of its kind in the world. Aerial flights made over this area revealed that except for the south end of James Bay, this area is only partially or poorly timbered with stunted tamarack and black spruce, and these occur mainly in blocks of variable size (fig. 1). About five fairly distinct muskeg types (Hanson and Smith, 1950) can be recognized.

Instead of fairly scattered isolated tracts of suitably open habitat in otherwise forested country, the essentially open character of this muskeg furnishes perhaps the largest single continuous block, or series of interconnecting blocks, of habitat available to the species in the northern sector of its entire range. This is not to imply that every square mile of this muskeg is suitable for sharp-tails—a species is seldom able to occupy all areas of its range; there are innumerable lakes and areas of floating vegetation that occupy a considerable portion of this muskeg. Nevertheless, the sheer size of this breeding range coupled with a cyclic peak must in part account for the unprecedented numbers of these birds that occurred over northern Ontario and easternmost Quebec in the emigration of 1932 (Snyder, 1935).

For a species in which communal courtship is carried out, the presence

or absence of a suitable dancing ground may be the factor deciding whether an otherwise satisfactory range is inhabitable. In Wisconsin, the race *campestris* resorts to grassy knolls, buckwheat stubble fields, and open marsh (Hamerstrom, 1939). Grange (1948) reports that sharp-tails utilized booming grounds similar to Prairie Chickens (*Tympanuchus cupido*), but "exhibited an even greater preference for wet marshes," in one case utilizing a solid mat of grass which lay over eleven inches of water. In Utah (Hart,

FIG. 3. Sedge tussock used by Sharp-tailed Grouse cock as a pedestal on which to display. See text for locality and date.

Lee, and Low, 1950), dancing areas used by the race *columbianus* "are usually found on points of higher elevations, ranging from small knolls to high hills, and usually in a weed-grass cover type."

From these accounts and others in the literature (Bent, 1932) it seems apparent that most dancing grounds possess either little cover or cover that is most commonly of low grasses or sedges which does not prevent the grouse using them from readily seeing one another. A fairly firm substrate also seems to be desired. Both factors may account for the fact that small knolls are often chosen for dancing grounds. Indirect confirmation of the importance of the visual aspect of dancing grounds can be derived from the habits of the closely related Prairie Chicken. In agricultural regions of Illinois, Prairie

Chickens often resort to fields planted to forage crops or small grains. When, however, the growth of vegetation eventually hides one bird from another, the males will make vertical leaping flights as high as 4–5 feet—presumably to keep in visual contact with the other birds as well as to be better seen themselves (Ralph Yeatter, personal communication). The Hamerstroms (personal communication, 1953) have also noticed that Prairie Chicken cocks make jump flights, particularly when new birds arrive, and that when the cover is high, the jumps are high (2–4 feet), and when cover is sparse, the jumps are often low (1-2 feet).

The northern Ontario muskeg embraces three main vegetation types: blocks of close grown stunted spruce or stands of open grown tamarack; brushy areas on hummocky moss- and lichen-covered ground (fig. 2); and water-logged grass and sedge areas which in the vicinity of lakes and ponds extend out for some distance over the surface of the water as a floating sedge mat. The first type obviously does not provide dancing grounds; the latter two types either lack a firm enough substrate or, from the standpoint of unobstructed vision, seemingly would not provide adequate display grounds. Yet for this species, visual psychic stimulation appears to be of paramount importance for breeding success. The visual as well as the substrate problem appears to have been solved by the muskeg sharp-tails of northern Ontario by resorting to the use of vegetational pedestals or tussock mounds, as shown in fig. 3. This photograph was taken on July 1, 1947, about 10 miles up the Lawabiskau River, a stream flowing into James Bay 20 miles south of the mouth of the Albany River. About a dozen performing birds were seen. These birds, insofar as could be told before flushing, and later by inspection of the area, were making use of these sedge mounds. Although note was not taken of the fact at the time, the photograph suggests that the sedge on the top of the mound was trimmed by plucking as well as trampled to create the saucer-like depression. A ramp, formed of trampled vegetation, can be seen leading up to this elevated platform. Many of these tussock mounds support small and very stunted black spruce by virtue of their slight elevation above the surrounding water-logged sedge vegetation. A male specimen collected from the tussock figured was shot in the early afternoon. The presence of birds on the dancing grounds at this time of day is probably related to the heavy overcast at the time.

In Wisconsin, Prairie Chickens are also known to boom on tussocks. "One booming ground which has about six inches of water each spring, has persisted since at least 1939, with the cocks using the tussocks and lodged mats intensively and flattening the tops with their feet" (the Hamerstroms, personal letter, 1953).

Snyder (1935) discounted a food shortage as a factor causing the emi-

gration from the Hudson Bay-James Bay region in 1932, stating that the birds collected during the flight were in good physical condition. In fact, the main plant foods eaten by Sharp-tailed Grouse (Schmidt, 1936; Swanson, 1940; Grange, 1948; Hamerstrom and Hamerstrom, 1951) are so omnipresent in the "Great Muskeg" that a food shortage seems inconceivable. For example, buds, leaves, catkins, or fruits of the following are taken: tamarack, junipers, willows, aspens, *Myrica gale*, alders, white birch, bog birch, roses, brambles (*Rubus*), dogwood, leatherleaf, bearberry, small

FIG. 4. The Attawapiskat River at a point about 35 miles inland from the coast of James Bay, Ontario. Note black spruce on the higher ground of the natural levees along the river.

cranberry, as well as numerous herbaceous plants. All these plants, and in some cases many related species, occur more or less abundantly in the muskeg or its associated forest edge along the major streams. Fall movements and concentrations of Sharp-tailed Grouse in the muskeg area as a whole are more likely a part and result of seeking heavier timber cover in advance of the winter than a food shortage *per se*. When the much more limited and well protected timbered sites, which occur chiefly in linear patterns along the rivers (fig. 4), become crowded in years of cyclic peaks as the result of shifts in habitat by local populations, as well as limited migra-

tional movements of more northerly populations, it is more readily appreciated how simple population pressure in combination with migratory unrest could precipitate a mass emigration.

In conclusion, it would seem that the above findings offer support for the opinion expressed by the Hamerstroms (1951, p. 208) that "the great bulk of evidence, however, indicates that sharp-tails do not need grain. It is possible that sharp-tails require either grains as food or woody vegetation for shelter to get through the winter—that a highly concentrated diet may make up for a deficiency in cover."

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ILLINOIS NATURAL HISTORY SURVEY, URBANA, ILLINOIS, JUNE 23, 1953

NEW LIFE MEMBER

Whitney H. Eastman was born at Fort Ann, New York, on April 24, 1888. A graduate of Dartmouth College, he is Vice President of General Mills, Inc. His deep interest in bird study has resulted in his acquiring a life-list of 749 species, which includes the Ivory-billed Woodpecker. A pair of these birds, which he located in Florida in March, 1950, were the first to be found in that state since 1924. He was instrumental in the establishment of a sanctuary for the pair. He maintains active membership in many ornithological societies and is on the National Executive Board of the Boy Scouts of America.

NOTES ON THE LIFE HISTORY OF THE BLACK-CRESTED ANT SHRIKE IN SURINAM

BY F. HAVERSCHMIDT

THE Black-crested Ant Shrike (*Sakesphorus canadensis*) is a medium-sized member of the large, neotropical family of antbirds (Formicariidae). In the male the head, sides of face, throat, and breast are uniform black. The abdomen and sides of the breast are slate gray, while the upper back is smoke brown. The wing coverts are edged with white as are the tips of the tail feathers. The male has a conspicuous black crest. The female is very different, as she lacks all the black, while the head, crest, and back are rufous, and the breast is ochraceous.

The weights of eight specimens collected by me in Surinam were: for five males, 20, 22, 24.6, 24.8, and 26.5 gm.; for three females, 20, 25, and 27.8 gm.

The species ranges from northern Colombia, Venezuela, Trinidad, and the three Guianas to northern Brazil. Peters (1951:160) recognized seven subspecies, the nominate race being confined to Surinam and French Guiana.

In the coastal area of Surinam the Black-crested Ant Shrike is a common bird in the undergrowth of secondary forest. It is especially numerous in the thickly overgrown sand reefs so characteristic of this region, but it also occurs in the vast "Parwa," the mangroves (*Avicennia nitida*) bordering the seacoast in a broad strip. In cultivated areas it is equally common in the coffee plantations and in waste land.

The birds are mostly seen in pairs, foraging not only in trees and shrubbery but also on the ground. Their flight is rather weak and they apparently do not like to cross open spaces, as they fly low over the ground when doing this.

In my garden, which is situated at the edge of a coffee plantation, they are seen the whole year 'round and in 1952 a pair nested twice, using the same nest, at a height of about three and one half meters in a tree (*Terminalia catappa*) and only about three meters from my balcony. This afforded an excellent opportunity to watch the birds during the whole breeding cycle, as they were quite confiding and never noticed me while I was watching them. Unhappily, in neither case was a brood reared, as the young were taken at night by an unknown predator or predators before reaching the fledging stage.

Song

I heard two different kinds of notes, which were uttered by both sexes.

The first of these, which I would call the song, is a rhythmical strophe of

similar but distinct notes like *u-u-u-u*, gradually becoming more rapid and ascending, instead of descending, the scale (Young, 1929:35). While the bird is singing the crest is erected to its full height and the head and tail go up and down with the calling. This song is uttered in such a way that the male and female are calling with this strophe to each other. I have heard a rather similar type of song, also uttered by both sexes, from relatives of this species, *Thamnophilus doliatus* and *T. punctatus*.

The other note of *Sakesphorus* is a questioning *tjuuurrr*, also uttered by both sexes.

Display

Though I never saw any display proper, I twice observed courtship feeding, in which the male fed the female with an unidentified object. The first case was on March 2, 1952, four days after the young of the first brood disappeared. The pair was foraging in a nearby bush when suddenly the male pushed something into the female's bill and immediately afterwards copulated with her.

The second instance was on April 11, 1952, the very day the repairing and rebuilding of the old nest was started in preparation for the second brood. Both birds were feeding about 20 meters from the nest tree, when suddenly the male fed the female. Then a second female arrived and was driven away by the pair. They were very excited, with long, erected necks, wings dropping somewhat, crests erected to their full height, and tails held somewhat elevated with the rectrices widely spread so that their white tips were very conspicuous.

Breeding Season

Eggs of this species in the Penard oölogical collection from Surinam now preserved in the Leiden Museum are dated January to May, and September (Hellebrekers, 1942).

My own data fall in the same periods. On January 16, 1947, I found a nest containing two eggs. The first egg of the first brood in my garden was laid on February 8, 1952, while the first egg of the second brood was laid on April 20, 1952. I also found a nest containing one egg on September 7, 1946. There are four seasons in Surinam, approximately as follows: a short rainy season, November 15 to February 15; a short dry season, February 15 to April 15; a long rainy season, April 15 to August 15; and a long dry season, August 15 to November 15. In all four seasons nests with eggs of this species are to be found, but data are too few to demonstrate nesting peaks and other characteristics of the breeding cycle.

Nest Building and Nest

The nest is a basket neatly woven of long and elastic pieces of straw, grass, and moss in the fork of two twigs in a shrub or a low tree, usually not far above the ground (fig. 1).

Nest building is accomplished by both sexes but the male is certainly more active than the female.

In the second brood in my garden the old nest of the first brood was used

Fig. 1. Nest and eggs of *Sakesphorus canadensis*, the Black-crested Ant Shrike. Photographed near Paramaribo, Surinam on January 16, 1947, by F. Haverschmidt.

again. It was only a small remnant, most of the bottom being gone. On April 11, the first day of construction, the male arrived with nest material six times, against one time for the female, beween 4:00 and 4:30 p.m. On April 12 I watched from 12:59 to 1:59 p.m. during which period the male

came 10 times and the female only twice. On April 13 I observed from 8:35 to 9:35 a.m., and the male came 12 times against 3 times for the female.

Nest building is conducted very rapidly in the first days but then it slows down and the finished nest is left alone for some days before the first egg is laid.

In the first nesting construction started on February 1, 1952, building was seen for the last time on February 4, and the birds were not seen again at the nest. The first egg was laid on February 6. Thus building lasted four days in this case.

In the second nesting the repairing of the old nest started on April 11, building was conducted actively on April 12 and 13, but on April 14 the birds were not seen at all. On April 15 and 16 nest material was taken only a few times to the nest in the early morning and then activity stopped. On April 17 the birds were not seen at all. On April 18 at 7:00 a.m. both birds were together at the nest. The female sat down in it for a moment; then both left. The first egg was laid on April 19. At the time the first egg was laid, in both nestings, I could distinguish the egg through the nest bottom while standing under the tree.

The building itself is interesting to watch. When weaving the long, elastic straws around the fork in which the nest cup will be made, the bird pushes a piece of straw forward over the twig and then pulls it under the twig backwards again. For the inner construction of the nest cup spider web as well as plant wool and moss is used. I never saw feathers in a nest. The nest cup is made of very fine and thin material, the shaping of it being accomplished by the usual wriggling movements of the sitting bird.

In the second nesting the pair had a rather difficult job completing the nest, as other birds (including *Pitangus sulphuratus*, *Thraupis episcopus*, and *Amazilia fimbriata*) regularly stole material from the nest in the course of construction.

Though rather flimsy and weak in appearance the nest is in reality very strong. This is necessary as it has to endure strong winds, in which the branch bearing the nest sways violently, as well as heavy rain showers. Long after this nest had been abandoned it was still in good condition.

Egg Laying

In all cases I know of the clutch consisted of two eggs, the regular number for the Formicariidae (Skutch, 1946:19). In both nestings in my garden the eggs were laid on alternate days.

In the first nesting the first egg was laid on February 6 between 12:00 n. and 4:00 p.m., the second one on February 8 between 7:00 a.m. and 5:00 p.m.

In the second nesting the first egg was laid on April 19 between 7:00 and 11:00 a.m., while the second egg was laid on April 21 between 7:30 and 11:45 a.m.

I refrained from weighing and measuring the eggs. For measurements the reader is referred to the material given by Hellebrekers (1942) from the Penard collection.

Incubation

In both cases regular incubation started after the laying of the second egg, though the first egg is covered during the day, from time to time, by one of the birds, but not at night. In the second nesting the first egg remained uncovered on April 19 during the entire day and throughout the following night though it rained hard. The nest was well protected by the big overhanging leaves but eventually the nest and its contents must have become thoroughly wet. On April 20 the female was at the nest at 10:00 a.m. and stayed until 10:07 when she was relieved by the male who stayed until 10:50. The female came back at 1:00 p.m. and sat in the nest until 1:30 when she was relieved by the male who sat until 1:55. Then the nest was left alone until 4:35 when the female came once more, only to leave at 4:38 when she was relieved by the male, who in turn remained only a few minutes. The nest was then left alone and the single egg was not covered during the night. The same was observed in the first nesting when the single egg was left uncovered during two nights.

This is in sharp contrast to the true incubation period, when the eggs are practically never left uncovered and both sexes incubate in very long sessions (see below).

The male and female shared in incubation, but only the female spent the night on the eggs. This has also been observed in other antbirds (Skutch, 1946:20). During the day, however, the male performed the larger part of incubation.

The night watch of the female was a very long one, as sometimes she had already been sitting on the eggs a rather long time before sundown, and relief the next morning often took place long after dawn. (Sundown in this region is between 6:00 and 6:30 p.m. and dawn about 6:00 a.m.) A few examples may illustrate this. February 10: female arrives at 5:45 p.m. and leaves next morning at 7:45 a.m. Male arrives at 7:55 a.m. February 12: female comes at 6:30 p.m., relieved by male the next morning at 7:40 a.m. April 25: female arrives at 5:00 p.m., relieved on April 26 at 6:25 a.m. April 26: female comes to nest at 5:54 p.m., relieved next morning at 6:32 a.m.

The nest relief after the night watch was practically the only instance in

TABLE 1
INCUBATION ON APRIL 27

Female		Male	
Intervals (based on 24-hour clock)	Time (in minutes)	Intervals (based on 24-hour clock)	Time (in minutes)
Dawn–0632	32	0632–0708	36
0708–0803	55	0803–0845	42
0845–1042	117	1042–1124	42
1124–1224	60	1224–1514	170
1514–1625	71	1625–1810	105
Totals	335		395
	(5 hrs., 35 min.)		(6 hrs., 35 min.)

which the eggs were left uncovered even briefly, as the female sometimes left the nest before the male had arrived, especially when he was late. On April 22 the female left the nest at 6:45 a.m. and started calling loudly. In the distance I heard the note of the male. It was 7:14 a.m. before the male settled down on the eggs. In the intervening period the eggs were left uncovered.

Nest relief practically always began with calling of the relieving bird as it approached the nest. This calling was begun at a long distance, and resulted in the incubating bird becoming immediately active and starting to respond while still sitting. Its crest was erected to its full length and its body went up and down with its calling. Strangely, both notes were used during nest relief. I never could establish a difference in their meanings. In most cases the incubating bird hopped directly out of the nest on the arrival of its mate. Rarely it had to be pushed aside.

As already pointed out by Skutch (1946:20) for other antbirds, the sessions of the incubating bird are very long, especially in the afternoon. Particularly long sessions noted in the present study were observed on April 25 when the female was on the nest from 12:06 to 2:37 p.m. (2 hours, 31 minutes), and the male sat from 2:37 to 5:00 p.m. (2 hours, 23 minutes). Table 1 shows the details of one whole day's watch, April 27.

During the whole of the incubation period both birds brought, from time to time, a single stem of straw or grass which was worked into the nest. This maintenance coincided mostly with ordinary nest relief, but it was always less frequent. During the day of April 27 it was done four times: by the male at 7:38 a.m. and 12:24 p.m., and by the female at 3:14 and 4:25 p.m. Twice I observed nest repair that did not coincide with reliefs. In these cases the incubating bird rose from the eggs to allow the other to weave the piece of straw into the nest. This happened on April 27 at 7:38 a.m. and again on April 28 at 4:54 p.m., both times while the female was sitting. This nest

TABLE 2
FEEDING OF THE YOUNG

Date	Periods of observation (based on 24-hour clock)	Feedings by ♂	Feedings by ♀	Total feedings
		Brood I		
February 23	1220–1320	2	2	4
February 23	1320–1420	0	1	1
February 24	1015–1115	0	0	0
February 24	1250–1350	1	2	3
February 25	1450–1550	1	1	2
February 26	1655–1755	2	1	3
Totals	six hours	6	7	13
		Brood II		
May 5	1200–1300	1	0	1
May 6	1000–1100	3	2	5
May 7	1200–1300	2	0	2
May 8	1015–1115	1	2	3
May 9	1040–1140	0	0	0
May 10	1030–1130	6	3	9
May 10	1625–1725	3	1	4
May 11	950–1050	4	3	7
May 11	1350–1450	2	3	5
May 11	1620–1720	2	1	3
May 13	1011–1111	4	1	5
May 14	1020–1120	4	2	6
May 15	1030–1130	0	2	2
May 15	1219–1319	4	2	6
Totals	fourteen hours	36	22	58
Totals both broods	twenty hours	42	29	71

repair continued throughout the incubation period and was last seen on May 4, one day before the hatching of the eggs.

Incubation lasted 14 days in both cases. In the first nesting the first egg was laid on February 6, the second on February 8, when incubation began. The first egg hatched on February 22 at 6:30 a.m. and the second one at 10:45 a.m. In the second nesting the first egg was laid on April 19, the second on April 21, when incubation started. The eggs hatched on May 5 before 11:55 a.m.

REARING OF THE YOUNG

The newly hatched nestlings are, as in other formicariids except the genus *Formicarius* (see Skutch, 1946:21), completely naked and blind. The eyes

of those I studied began to open at the age of three days and were wholly open at four days. The gape is orange-yellow.

On the day of hatching they were constantly covered by one of the parents but by the second day they were left uncovered for some time after a feeding. On May 6 (eggs hatched May 5) the male fed the young at 10:37 a.m. and left immediately afterward. At 10:50 the male fed them again and left, returning with food at 10:57.

In the following days the young were covered very irregularly during the day but always during heavy rain showers; this lasted until the last days I was able to watch them, *i.e.*, on May 13 and 15 respectively, when they were 8 and 10 days old and the male sheltered them during heavy rains.

The young were fed by both parents and here again the male's share was slightly larger than the female's. In Table 2 is given the feeding frequency in both nestings as observed during 20 one-hour periods. The food consisted

TABLE 3

DAILY WEIGHTS OF THE YOUNG IN GRAMS

Date	Age in days	Nestling 1	Nestling 2
May 5	0	3.3	—
May 7	2	6.1	3.5
May 8	3	8.0	4.1
May 9	4	10.3	5.8
May 10	5	10.3	5.8
May 11	6	11.6	6.6
May 12	7	13.6	8.7
May 13	8	15.6	10.9
May 14	9	15.8	10.9
May 15	10	16.8	—

mostly of insects brought one at a time and as the nest was so close by I was able to identify the food in several instances. I recognized spiders, small butterflies and moths, grasshoppers, caterpillars, and even a very small lizard which was taken to the young by the male on May 14.

The feces of the nestlings were swallowed by both parents, immediately after feeding, while they stood on the nest. In the cases of large droppings they were taken away. I also observed another kind of post-feeding behavior, called "nest-probing," which is of common occurrence in small passerine birds. After feeding, and the swallowing of a clump of feces, the bird remains on the nest, looks into the nest bottom, and starts pecking into the middle of it, afterwards swallowing an unidentifiable object. The following example illustrates a typical case: on February 26, the male arrived at 4:58 p.m., fed the young, and swallowed a clump of feces, afterwards pecking into

the middle of the nest, making wriggling movements to reach something on the bottom. When his head emerged again he swallowed something which remained unknown to me. He was busy in this way until 5:04 p.m., and remained thus engaged for six minutes at the nest. Though the meaning of this nest-probing is not yet quite clear it seems likely to be a removal of nest parasites and also of remnants of food. It is certainly something quite different from the swallowing of the feces.

Just as in the incubation period, only the female spent the night covering the nest. This lasted until the last day I watched this brood. The remaining nestling was then (May 15) 10 days old.

In Table 3 are given the daily weights of the nestlings of the second brood. As is clear from these figures one of them soon fell behind in weight and the difference in size was considerable in the last days. On May 15, at the age of 10 days, it lay dead in the nest. It was already decomposing and was apparently too big to be removed by the parent birds. In the morning of May 16 the remaining youngster had vanished and evidently had been taken the night before by an unknown predator, though the nest was entirely intact. The same had happened to the first brood when, on February 27 at 7:00 a.m., the nest proved to be empty but also quite intact. Whatever had happened had perhaps occurred just before the male arrived with food, followed by the female. Both birds sat on the nest rim looking into the empty nest, and then left.

Summary

Sakesphorus canadensis (Family Formicariidae) is a common bird in the undergrowth of the secondary forest in the coastal area of Surinam; it is equally numerous on the sand reefs, in the mangroves along the coast, and in the wastelands and plantations. The song, which is uttered by both sexes, is described. Courtship feeding occurs. I have recorded nests from January until May, and in September. The nest is a neatly woven basket in the fork of a twig, usually placed not far above the ground in shrubbery. Two successive nestings by one pair were observed and studied in some detail. The nest is built by both sexes though the male's share of construction is the larger. The clutch consists of two eggs which are laid on alternate days. Incubation starts after the laying of the second egg and lasts 14 days. The male and female share in incubation, the female sitting at night, and the male's share during the day being a trifle larger than the female's. The nestlings are fed by both parents but again the male's part is the larger. Daily weights of the nestlings are given as well as data on frequency of feeding. The nestlings are covered by both sexes during the day of hatching and later on, irregularly, during daytime. At night they are covered by

the female alone. The young are fed insects, one at a time. Once they were given a small lizard. The food was secured in trees, in shrubbery, and on the ground. Feces of the young were swallowed or taken away when too large. Another kind of post-feeding behavior, "nest-probing," possibly consisting of the removal of nest parasites and food remnants, was observed.

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Paramaribo, Surinam, December 31, 1952

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THE BIRDS OF CALICOAN, PHILIPPINE ISLANDS

BY NATHAN S. POTTER, III

FROM February 15 to November 5, 1945, I was stationed at the U. S. Naval Supply Depot on Calicoan, a coral island about 10 miles long and half a mile wide, lying approximately 300 yards off the southern tip of Samar in the Philippine Islands. Except for a few palm groves, the island was covered with a dense, nearly impassable forest. The island was sparsely populated. There was a thin layer of sandy earth in the palm groves and in a few of the low gullies which supported banana plants; the rest of the island was bare coral, even in the dense forest areas. The gulf shore was mostly narrow sandy beach, but the Pacific shore was a barren coral cliff from 10 to 60 feet high. A narrow ridge from 100 to 200 feet high ran lengthwise down the center of the island. This central ridge was densely wooded and impossible to penetrate except along one or two native trails, which were very difficult to find and equally hard to follow. Along the edge of the central ridge were a few areas of low, scattered brush. By early summer the palm groves and level areas had been cleared and taken over by naval activities.

Calicoan has probably not previously been visited by an ornithologist, although the central part of Samar was worked by the J. B. Steere expedition (1887-88), Bourns and Worcester (1890-92), and by Whitehead in 1896.

My field work was carried on almost daily from 4:30, or 5:00, to 6:00 p.m., and toward the end of the summer I spent most Sundays and an occasional full afternoon in the field, making a total of approximately 350 hours of field work. It was practically impossible to carry out any systematic research program due to the demands of naval service and the fact that the development of the naval base required the clearing of almost all of the island except the high central ridge. I was able, however, to obtain some data on the life history and behavior of several species and to collect specimens of most of these, some of which had not previously been recorded from Samar.

The greater part of my field work was done in an area of about 45,000 square yards in the central part of the island, determined from the available charts to be 10° 59' 30" N., 125° 47' 40" E. Part of the area was a small saucer-like valley forming one of the two or three natural breaks in the high central ridge. All specimens taken are now in the University of Michigan Museum of Zoology.

Butorides striatus carcinophilus. Little Mangrove Heron.— ♂, September 29. Eyes yellow; bill black, with basal half of lower mandible greenish-ivory; pea-green spot at the base of the bill in front of the eye; legs and feet brownish in front, green to yellowish in back; foot-pads yellow.

I seldom searched the beach for birds, and the few birds of this species seen were single individuals, feeding on coral reefs in September and October.

Egretta sacra. Reef Egret.—♀, September 14. Eyes yellow; feet greenish-yellow. It was alone on the coral rocks at the edge of the ocean. Species not recorded from Samar or Leyte by McGregor (1909) or Hachisuka (1932).

I saw five or six birds of this species feeding at low tide on the coral reefs, the first on June 1. From June 20 through July, I saw one or two almost daily, feeding on the reefs at any time of day; thereafter I saw them only occasionally (through October). Probably not more than six individuals regularly frequented the half-mile of beach I observed. One was seen feeding in a tidal pool (about 25 feet in diameter) with a white egret, probably the same species in the white phase; they were antagonistic, and each would drive the other way when it approached closer than four or five feet. While feeding, the egrets actively searched the shallow water, their necks stretched forward just above the surface.

Haliastur indus. Braminy Kite.—Not collected. I saw the species, at least once a week from April to October, soaring high over the center of the island and occasionally up and down the shore.

Accipiter trivirgatus extimus. Crested Goshawk.—♂ and ♀, September 5. Bills brownish-gray; eyes, legs, and feet yellow. Stomach of ♂ contained lizard-like item, that of ♀ was empty. Wing lengths, 179 mm. in ♂ (182-188 reported by Mayr in Delacour and Mayr, 1945:106); 205 mm. in ♀ (208 reported by Mayr).

The pair collected were observed speeding through dense forest in a chase, the ♂ in the lead. The ♂ lit in low brush about 4 feet above the ground, and the ♀ perched at a height of about 15 feet, some 20 feet away.

Spilornis cheela holospilus. Serpent Eagle.—♀, July 19. Bill bluish-slate except for black tip; eye yellow; stomach held grasshopper and brown beetles 2½ inches long.

♂, August 19. Eye, feet, and legs yellow. An opaque scar on the cornea over the iris probably rendered this bird blind in one eye in the opinion of the two station doctors. The stomach was crammed with thick insects an inch long, a land crab, and some bits of shell. The crop contained a 17-inch brownish-black snake with prominent fangs. This specimen was shot at 5:30 when it flew into a tree after chasing a small bird into dense brush.

Two or three of these eagles were seen every week from March through October, usually in singles or pairs, perched, as a rule, on high dead limbs overlooking an open area. Once in October, I saw 5 in an area of 10,000 square yards.

Their call was a loud, high, tremulous whistle somewhat like that of a Screech Owl (*Otus asio*). They called back and forth and would reply if I imitated them.

Microhierax erythrogonys meridionalis. Samar Pigmy Falcon.—♀, May 10. Bill and feet black; eyes brown; stomach contained bright green orthoptera-like insects; ovary about 6 mm. One of a pair perched at dusk on a dead tree overlooking a pool of water. Mud was plainly evident on the bill and legs of the specimen taken.

♀, May 18. Soft parts colored as above. Taken at dusk from a dead limb at the top of a high tree.

I saw only five or six of these Pigmy Falcons on Calicoan. They flew and acted much like Purple Martins (*Progne subis*). Near the end of May, I saw a pair flying to and from a hole about 30 feet up in a high tree, each bird entering the hole alternately and sometimes remaining inside for about 30 seconds.

Pluvialis dominica fulva. Pacific Golden Plover.—2 ♂ ♂, September 17. Bills black; legs and feet slate; eyes brown.

The two specimens I collected were the only birds of this species that I saw. They were standing within a foot of each other on barren rock 50 yards from the sea at noon during low tide. McGregor (1909:104-105) gives no Samar record for this migrant but reports it elsewhere in the Philippines on grassy or wet sites away from the coast. Delacour and Mayr (1946:70) record it as a "common visitor" in the Philippines.

Numenius phaeopus variegatus. Whimbrel.—2 ♀♀, September 15, from a flock of 8 on the rocky coast. Bills black except the basal half of the lower mandible, which was flesh color; feet chalk blue.

♀, September 18, shot from a flock of four. Bill and feet as above; eyes blue-black. Stomach contained grape-like fruit full of small seeds similar to that found in the stomach of the Blue Rock Thrush.

A flock of eight, first seen about September 12, comprised, I believe, all the birds of this species that were in the area. One individual remained and was seen regularly until mid-October. They were always seen resting on the rocky shore, feeding on the exposed reefs at low tide, or flying over the water parallel with the coast line. They were usually feeding with several other species of shore birds, and when these mixed flocks were disturbed, each species formed a flock of its own and flew off, without reference to the actions or direction of the other flocks.

Heteroscelus incanus brevipes. Polynesian Tattler.—2 ♂♂, September 20. Bills black, except for yellowish base of lower mandible; eyes blue-black; feet and legs greenish-yellow; stomachs empty. They were shot from a flock of about 20 of the same species resting on the rocky coastal ledge at 5:45 during high tide. Both birds were very fat.

I saw three flocks of from 10 to 20 birds regularly from mid-September to mid-October. McGregor cites no record from Samar but notes that it occurs in great numbers on tide flats during migration.

Ereunetes minutus ruficollis. Little Stint.—♀, March 30. Caught by hand in coral sand along the coast at night during heavy rain and wind; possibly blinded by car lights.

I saw a group of 6 to 10 birds believed to be this species in the same general area for a week before and a few days after the date this specimen was taken. While walking along the beach in bright moonlight about 9 o'clock on March 23, I saw many small shore birds, which may have been this species, feeding along the water's edge.

While this species is not reported from Samar or Leyte by McGregor (1909:135), it is reported as common in the Philippines by Delacour and Mayr (1946:73).

Phalaropus lobatus. Northern Phalarope.—♀, October 1. This fat, crippled specimen was caught by hand at the rear of one of the naval warehouses against which it had probably flown. I saw no other phalaropes.

Since Mearns (1909:435) first recorded this species from the seas around the Philippines, it has been reported by McGregor (1918:10) at Luzon, and by Hachisuka (1932:323) at Mindanao and between Zamboanga and Isabella. It is reported by Delacour and Mayr (1946:73) as wintering in the sea south of the Philippines.

Phapiteron leucotis albifrons. Samar White-eared Pigeon.—♂, May 22. Bill purple with black tip; eyes red and edge of eyelid purple; feet reddish-purple; stomach contained large green seeds and red berries; one of a pair feeding at dusk in a bushy tree 20 feet high; testes moderately enlarged.

♂, July 8. Bill black with basal half purple; eyelids blue; feet dark red; testes moderately enlarged.

I saw only four of these pigeons, including the two specimens collected. Their flight was very rapid and direct. All four were seen in low brushy areas of the forest.

Ducula aenea chalybura. Bonaparte's Imperial Pigeon.—♀, September 16. Eye and edge of eyelid ruby red; bill slate-colored, with lower half of maxilla and tip of mandible pearl-gray; feet purple; the crop contained hard fruit the size of a hickory nut; shot in mid morning, one of a pair.

These pigeons were fairly common but were very hard to approach, partly because of the almost impassable woodland where they were usually feeding or roosting. From two to six were seen daily in late afternoon. They were active throughout the day, usually above the forest and using the upper branches of high trees for perches; and they seemed most active just before sundown. They chased, and were chased by, crows. Sometimes a group of four or five would be chased from the top of a high tree by the Tarictic Hornbill which, working up the tree by hopping from branch to branch, drove the pigeons away one after another. They were usually seen singly or in small groups of up to six individuals. Their voice was a low penetrating *coo.* They were very wary and when disturbed usually flew out of sight, settling down in some distant location rather than returning to their original perch. They are heavy, powerful birds and are difficult to kill. I have hit four or five of these birds very hard with size 7½ shot from a 20-gauge shotgun and seen them coast into the brush on set wings, but I never recovered one of them.

The flight of these birds is powerful and magnificent, usually direct and very fast. On March 20 I first saw one of them "swan dive." Flying rapidly and rather high, the bird threw back its head and wings and rose, at a 45° angle, to a point 50 feet above the previous line of flight. As it slowed almost to a stop, it pivoted, and, with head and wings in the same position, went into an almost perpendicular dive. At a height of from 20 to 30 feet above ground, it levelled off and flew out of sight. From the start of the upward swoop to the levelling off, the bird's head and wings were held in the same position that a man holds his head and arms while executing a swan dive. It was a remarkable display. I saw it at least twice when I was fairly certain no other birds of the species were in the immediate vicinity. The dive was performed from March 20 through October. The dive terminated (1) by an upward swoop on set wings to a high branch of a tree where the bird lit and *cooed,* (2) by an upward swoop to a branch where the bird perched silently, or (3) by continuing flight out of sight.

These birds fed in the same trees with Tarictic Hornbills, Philippine Cockatoos, Racket-tailed Parrots, and Coletos.

Cacatua haematuropygia. Philippine Cockatoo.—♀, April 27. Bill slate; eyes brilliant red; skin surrounding the eye alabaster with purplish tinge; feet slate-gray with blackish toes; crop full of white rectangular seeds ¾ of an inch long.

♀, August 22. Bill slate-blue; eyes coral red; skin around the eye alabaster; feet slate.

I shot the first specimen at dusk from a group of three birds going in and out of a large hollow limb 25 to 30 feet above the ground. For three or four days thereafter I saw two going in and out of the hole at dusk.

In late June I heard young in a nest in a hollow limb of a tree about 20 feet above ground. From March until September, I saw from 2 to 6 of these cockatoos daily, usually singly or in pairs. From September to November, I often saw small flocks of as many as 8 birds. They make a loud raucous call while feeding and occasionally even while in flight. Their flight is usually swift and direct with a rapid wing beat, although on three occasions I saw them elude capture by a hawk by rapid darting and weaving while squealing frantically.

Prioniturus discurus discurus. Racket-tailed Parrot.—♂, September 30. Legs blue-gray; bill lighter, or slate-blue.

I did not see these parrots until mid-summer, but from then on through October they were increasingly common. From the first of September through October 6 they could be seen at any time in the wooded areas. They were very noisy birds, screeching both in flight and while feeding in the tree tops with Bonaparte's Imperial Pigeons, cockatoos, Coletos, and Barred Graybirds. The flight was fast with a rapid wing beat, but seemed labored. The head of this specimen showed a molt in progress, the crown being mottled green and blue; the tail feathers were well-worn.

Loriculus philippensis worcesteri. Worcester's Hanging Parakeet.—♂, April 30. Eyes black; bill red; feet orange-brown; testes not enlarged.

♂, August 3. Shot feeding in vines 20 feet above ground in fairly open area; testes slightly enlarged.

♂, October 11. Bill red; eyes black; feet and legs orange; shot at dusk while feeding with Barred Graybirds, Coletos, and young Philippine Glossy Starlings.

I saw only five or six of these birds in addition to those collected. All were seen singly, foraging high in leaves or vines in tall trees. Their flight was fast and direct, appeared labored, and was accompanied by a high-pitched, rapid whistle somewhat like that of the American Golden-eye (*Bucephala clangula*). I did not witness the undulating flight reported by Delacour and Mayr (1946:103).

Cuculus saturatus horsfieldi. Oriental Cuckoo.—♀, October 22. Mandible black; maxilla blue-gray; inside of mouth and throat orange; feet and legs yellow; shot at dusk from the top of a stump six feet high; stomach contained iridescent green bugs and 2 "katydids" (orthopteran family Tettigoniidae). This specimen is the only bird of the species seen. It is reported from Mindoro and Palawan by McGregor (1909:372), and as a rare winter visitor by Delacour and Mayr (1946:106).

Cuculus canorus telephonus. Common Cuckoo.—♀, October 19. Eye brown; eyelid yellow; mandible black; maxilla green-gray; feet pure yellow; stomach contained gray worms 1½ inches long with yellow head and black stripes around the body; shot at dusk at the edge of dense woods after a shower; the only bird of the species seen. In action the bird was like a fly-catcher in that it took short flights back and forth from a perch, returning each time to the same tree to light on a limb or even on the vertical trunk of the tree.

Eudynamys scolopacea mindanensis. Philippine Koel.—♂, September 3. Eyes carnelian; bill grayish-blue except for brownish tip of maxilla; feet grayish-black; stomach contained two hard nuts the size of acorns; shot in dense low growth.

♀, October 14. Mandible light jade; maxilla slate color with brownish tip; eyes red; feet gunmetal; stomach contained hard seeds like dried peas; one of a pair in the top branches of dense woods.

I saw a total of eight of these birds, including three pairs, all in forest areas with dense undergrowth. I never heard them give any call. They were difficult to collect because of the dense brush, but they seemed curious and would watch me silently from one or two vantage points before disappearing. Once when I was trying to attract some small birds by "squeaking," one dived at me from some high cover, and I caught glimpses of it as it flew about in the brush for possibly 30 seconds before disappearing. The specimen collected October 14 was one of a pair which were well aware of my presence and watched me for two or three minutes from vantage points before I collected the female. After the shot, the other bird stayed around in the thick cover watching me for three minutes before leaving.

McGregor (1909:379) reports that the food usually consists of insects, but in one case fruit. Delacour and Mayr (1946:109) state, "mostly a fruit eater."

Centropus viridis viridis. Philippine Coucal.—♀, September 22. Eyes brilliant, dark red; bill black; feet bluish-gray; stomach contained a green insect similar to a katydid.

Only six of these birds were seen between June 30 and mid-October; (two seen singly, the others in pairs). They were shy and very difficult to see. On four occasions I heard them calling in the brush 5 to 15 feet from me and was unable to see or flush them. I did not even see the only specimen taken until after I shot it. I had been sitting silently in a fairly open low brushy area and heard the bird approach, occasionally calling, to the opposite side of a dense bush six feet away. I shot into the bush and found the bird in the center of the bush about two feet above the ground.

Their call is somewhat like that of a monkey: *chook, chook, chook, chook,* voiced fairly rapidly in a deep, low pitch. In flight the birds appeared reddish rather than brown, and their wing action was similar to that of a pheasant (*Phasianus*). The coucals were usually on the ground, sometimes in brush or low trees but never more than eight feet from the ground. On one occasion I followed a coucal for about one-half mile along the edge of the low brush at the coast. The bird covered this distance by a series of flights of about 75 yards each, commencing each flight after climbing up six or seven feet in the brush. The bird lit on the ground each time, and after two or three minutes made another flight.

Halcyon winchelli. Winchell's Kingfisher.—♂, May 13. Eye brownish-black; bill black; feet pale green; testes moderately enlarged; stomach contained bright green beetle-like insects.

This specimen was the only bird of this species I saw. It was perched motionless on a dead limb about 12 feet above ground in a fairly open forest area at dusk.

Halcyon chloris collaris. White-collared Kingfisher.—♂, June 13. Bill ivory except for black tip; eyes dark brown; feet brownish-gray; stomach contained claw of a crawfish; testes slightly enlarged.

♂, June 22. Bill ivory except distal 1/3, which was black; stomach contained green insects like katydids 2½ inches long; testes enlarged.

♂, July 3. Testes slightly enlarged.

Four or five of these common kingfishers could be seen at any time in open or grassy areas where there were a few scattered trees suitable for perches. They were frequently seen along the rocky coast and occasionally in the forest, but their preferred habitat was in the open palm tree areas. They were almost never seen over 150 yards from the sea but were seen only twice feeding at the water's edge or in the small tidal pools. They concentrated in areas where the underbrush had been cleared and burned by the Navy.

In voice, action, and flight they are similar to Belted Kingfishers (*Megaceryle alcyon*). Wolfe (1938:213) has reported a mating ritual in which both birds alternately leave their perch, fly to the ground and return. At Calicoan I saw this activity several times, but in each instance the birds were obviously feeding on ground insects. From a perch six or seven feet high they flew to the ground to catch an insect, returning immediately to the perch. The maximum successful detection distance was about 50 feet. Some single birds were also seen feeding in this manner. On only one occasion did I see both birds of a pair using perches in the same tree or bush while feeding in this manner.

In mid-morning one day in late May or early June I observed a somewhat similar activity. Two of these kingfishers were perched about a foot apart on the same limb

25 feet above the ground and 100 feet from the stump of a dead palm tree in which there were two old holes two or three inches in diameter and approximately 20 feet above the ground. The birds took turns flying to the dead palm tree, giving the rotten wood a peck, and returning to the perch. One bird would not leave the perch until the other had made its peck and returned. They were pecking at the stump of the dead palm tree near the two old holes. The birds did not light and then peck like a woodpecker, but hit the tree with their bill as they lit, occasionally giving an extra peck or two before returning to the perch. In spite of the soft rotten wood they seemed to make practically no headway on a new hole. I am unable to attribute any significance to this behavior, which I watched for nearly an hour and which was still going on when I left. Within the next two or three days, the area was cleared by bulldozers and I inspected the fallen stump. It was soft rotten wood and there were no visible insects. The two cavities showed no evidence of use as nesting sites, and the result of the recent work of the kingfishers was barely visible.

Single birds were often seen roosting at night in the branches of palm trees close to the trunk. Such a roost was used regularly by one bird for a period of about two weeks before I collected it on July 3. There was a great deal of chattering and calling in the early morning by this bird before he left his perch. On March 26 one was seen late at night roosting on a dead limb about eight feet above the ground; this perch was in a small patch of brush in a palm tree area.

Alcedo atthis bengalensis. River Kingfisher.—♀, October 7. Maxilla black; mandible orange-coral; eyes brown; legs and feet brilliant orange-coral; stomach contained aquatic insects.

The single bird of this species seen was found feeding in pools formed by the spray thrown up from the surf along the rocky coast. This bird was first seen late in September and finally taken on the above date while it was fishing from perches in the crevices of the rocks. It was usually found around the same pool, which was about 25 feet in diameter and surrounded on three sides by rock walls 10 feet high.

Merops viridis americanus. Chestnut-headed Bee-eater.—♂, October 14. Bill shiny black; eyes brilliant dark red; feet and legs grayish-black; wide pads on feet; stomach contained small bugs.

The flock of five bee-eaters from which this one was taken were the only bee-eaters I observed; I watched them for about two hours as they fed from trees of medium height at the edge of dense woods. They flew much like flycatchers, leaving their perch for a short flight after an insect and then returning to the perch, where they would stand very straight like a night heron (*Nycticorax*) and bow ceremoniously two or three times. They were feeding on the wing, catching insects in the air as well as off the leaves of adjacent trees. Their voice was rather soft and pleasant, a melodious whistle reminiscent of some of the notes of the Philippine Oriole.

Eurystomus orientalis orientalis. Dollar Bird.—♂, May 2. Bill and feet tomato-red, with the very tip of the mandible black; eyes brown; testes not enlarged; stomach contained insects.

♂, October 17. Eyes brownish-black; bill and legs orange; stomach contained bright, iridescent green bugs; taken at dusk while hawking insects from a perch on a dead stump 10 feet high.

These birds were rather common; as many as four or five could usually be seen during a half-hour walk. Their flight is strong and buoyant, much like that of the Nighthawk (*Chordeiles minor*). During all the months I was on the island, these birds would usually

form in flocks of 6 to 10 just before dusk and, flying high in the sky, give an astonishing exhibition of aerial acrobatics. Throughout these maneuvers they called in their peculiar harsh voice. In March and early April I observed what was probably a courtship flight. This flight was at about tree-top level and never approached the heights of the usual evening flights which were not as common at this time of the year. This possible courtship flight was similar to the "swan dive" of Bonaparte's Imperial Pigeon but much less spectacular. It was a graceful buoyant maneuver of short duration, lacking the speed and sweep of the Imperial Pigeon's dive.

The Dollar Birds are accomplished and graceful flyers. In late June I once saw one flying about 10 feet above ground, approach to within 4 feet of the trunk of a tree, and then rise straight upward and go directly into a hole 20 feet above the ground.

They call back and forth throughout the day in their unpleasant harsh squawk while in flight as well as while hunting or resting. The birds were active throughout the day and could be seen at any time resting or feeding from perches on dead limbs or stumps in open areas or at the edge of the forest. Their perches vary in height from 10 to 30 feet. I have seen them catch insects on the wing, from trees or bushes, and from the ground. They were attracted to the same holes which attracted Coletos and Crimson-backed Woodpeckers.

Buceros hydrocorax semigaleatus. Calao or Rufous Hornbill.—♀, June 8. Casque and base of bill red; eyes aquamarine; legs and feet red; stomach contained insects like katydids, and the intestines contained seeds like those of a watermelon; shot from a group of three feeding in dense woods.

♂, June 23. Casque and base of the bill red, shading through yellow to ivory near the tip; legs and feet red; eyes corn yellow; shot from a bushy tree while feeding on soft fruit the size and shape of a hazelnut.

♀, July 18. Casque, bill, legs, and feet same as June 23 specimen; eyes aquamarine; one of a pair; ovary not enlarged. This bird was covered with ticks and lice but seemed in good physical condition. Shot from the top of a tall tree while feeding with the ♂ taken the same date.

♂, July 18. Casque, bill, legs, and feet same as June 23 specimen; eyes corn yellow; presumed mate of preceding ♀; shot when it flew to where the ♀ had fallen; testes not enlarged.

♀, August 22. Eyes aquamarine; other soft parts as above; ovary not enlarged.

From February through August, I saw these birds singly or in pairs; twice, as on June 8, three birds were seen together. On the average, I saw one or two birds a week always in or above dense forest. In September all the local birds formed into a single flock of some 15 to 18 individuals. From this time on they became very noisy and could usually be heard calling at dawn and at dusk, or at any time during the day if disturbed in the forest. I believe the flock toured the island up and down the high central ridge for they passed my shooting spot almost every afternoon, going either up or down the island. There was certainly only one flock in the central part of the island, at least, because (a) one distinctively buff bird was always seen in the flock and (b) two flocks were never heard calling (their calls can be heard for at least a mile). I am certain that this flock moved at least two miles up and two miles down the island from my quarters.

The flight of these hornbills is much like that of a pelican (*Pelecanus*) in that it consists of a few wing strokes followed by a long glide. A pronounced "swish" was audible during their flight. Their voice or call was reminiscent of that of the Sandhill

Crane (*Grus canadensis*) in its eeriness and tonal carrying qualities. The native name, "Calao," gives an excellent idea of the sound of their call. I am quite sure I once heard one give the same call as the Tarictic Hornbill, and on another occasion I heard a noise which could have been made by beak-snapping or by knocking the beak against a large limb or the trunk of a tree.

On five or six occasions when these hornbills were feeding in the tops of trees near the extreme ends of branches, I have seen them lose their balance and fall from the tree until they were able to catch lower branches with their feet or wings, or until they recovered themselves sufficiently to fly. It was the noise of their falling through the branches that called my attention to the three birds seen on June 8. They sometimes fell nearly 20 feet before recovering flight.

The edges and insides of their bills were sticky with fruit or sap, and most of the bill was covered with a yellowish powder-like pollen.

The Calaos were easily frightened in the woods and at the first unusual sound would cease activity and concentrate on locating the source and cause of the noise. After a moment or two they would quietly fly away one by one or they would all leave at once with a frightful honking clatter. They usually commenced their flight with a short down swoop to gather momentum. A pair first seen on March 21 in the vicinity of four very tall bushy trees in dense forest stayed in that immediate area for a little over a month until the area was cleared by blasting and bulldozers. Usually two and never more than two were seen in that locality. During this time they would occasionally call at morning and evening, and six or seven times I heard them call during the middle of the day.

At about 5:00 p.m. one day in early October, the flock was leisurely crossing a low valley, feeding in the small bushes and banana plants. One bird flew up and lit on a bare limb 40 feet above the ground. Slowly, one by one, the others flew up and alighted side by side on the same limb, all facing in the same direction. Each of the last two or three had to knock another off the limb in order to find room to alight. While this jockeying for the last place on the limb was still going on, the whole flock suddenly scattered and resumed their feeding in the valley, slowly working into the forest and on up the island. It was about five minutes from the time the first bird flew to the limb before the flock resumed feeding.

It is interesting to note that in the above males the eyes were corn yellow, and in the females they were aquamarine. Hachisuka (1934:155) gives the iris as "light yellow, (light green in living birds)."

Penelopides panini samarensis. Tarictic Hornbill.—♂, May 12. Bill black, brown, and ivory; eyes dark red to reddish-brown; feet grayish to black near the toes; stomach contained dark green grape-like berries, which were full of flat seeds like those of a cucumber; testes not enlarged.

♂, May 26. Eyes ruby-red, feet slate-gray; stomach contained a bright green katydid and seeds; testes not enlarged.

♀, June 18. Bill agate with gray at the base; eyes red; stomach contained fruit, or vegetable matter, and a bright green beetle; ovary not enlarged.

♂, October 23. Eyes red; feet slate; stomach contained hard brown seeds like dried peas; shot from the top of a high tree on the edge of a cleared area; molting.

I saw the first pair of Tarictic Hornbills on March 26, and thereafter an average of two a week through October, always singly or in pairs except on two occasions in October, when three were seen together. They usually traveled in pairs, foraging up and down the island, never in the company of other birds.

Their call was loud and penetrating with good carrying qualities, and sounded exactly like a child's Halloween horn—a raucous and tinny *toot toot*. Often two birds as much as 150 yards apart would *toot* back and forth as they worked up or down the island. Their flight, consisting of a few wing strokes and then a glide, usually started with a downward swoop from the treetops and terminated in a short upward glide to one of the lower branches of a tree.

These hornbills seemed to have an active dislike for all other birds and were frequently seen to chase Imperial Pigeons and Racket-tailed Parrots from trees by hopping up the branches after them. They are awkward and gawky both in flight and while in trees, although adept at catching food. I once saw one leave the branch of a large tree and swoop down to the bare trunk of a tree some 100 feet away after a lizard which was climbing the tree trunk. Upon reaching the lizard, the bird seized it in his beak and fell, flopping helplessly to within four feet of the ground before recovering flight and returning to a different branch of the first tree to chew and swallow the lizard. On a few occasions I have seen a Tarictic Hornbill lose balance while reaching for food at the tip end of a branch and fall from the tree. These hornbills were almost always seen in the treetops in the forest although sometimes they hopped around on fallen logs or large limbs near the ground.

Dendrocopos maculatus leytensis. Pygmy Woodpecker.—♀, May 31. Eyes brown; maxilla black; mandible yellowish except for a black tip; feet green.

This specimen was the only bird of this species that I saw. It was traveling with a pair of Philippine Creepers, one of which I collected. The woodpecker was shot while pecking and chattering on a dead limb in the crown of a tree some 30 feet high. Its flight was typical of woodpeckers.

Chrysocolaptes lucidus rufopunctatus. Crimson-backed Woodpecker.—♀, May 10. Eyes pinkish-red; bill black; feet greenish.

♀, August 7. Eyes bright red; bill blackish-brown; feet greenish; stomach contained 1½-inch long grubs; shot at dusk 30 feet from the ground in a dead tree.

♀, September 9. Eyes red; bill black; feet greenish-gray; stomach empty; shot at 8:00 a.m.

♂, September 9. Eyes red; feet greenish-gray; bill black; stomach empty; shot at 8:00 a.m. with above specimen.

♂, September 9. Eyes red; bill blackish-brown; feet greenish-gray; stomach empty; shot at about 8:45 a.m. and about 100 yards from where the two previous specimens were taken.

In addition to the above specimens only five other birds of this species were seen, although a flock of five birds believed to be of this species was seen just at dark on April 3, some 30 feet up in a huge tree, working in and out of three or four holes in the tree. This same group of five birds was seen two or three times during the following week at the same holes just at dark.

In flight, voice, and behavior these birds are very much like the North American Flicker (*Colaptes auratus*). Alive they look or appear much more crimson than they do as skins, and their necks look incredibly thin for a bird of their size.

On September 9 I watched three of these birds for about 10 minutes before the pair was collected at 8:00 a.m. The other specimen collected at 8:45 on the same date is believed to be the third member of this group. The three birds were chasing each other in short flights between trees in a fairly open forest area. They would alight at the base of a tree and then chase each other up and around the trunk to the crown of the tree, then fly to

another tree to repeat the procedure. Sometimes only two would take part in a chase, although all three kept chattering. Finally the female and one male flew to opposite sides of the trunk of a tree, leaving the other male about 100 feet away. As the pair moved jerkily up the tree trunk, chattering and peeking around the trunk at each other, they were collected. The third bird flew into the woods and was probably the one collected three-quarters of an hour later.

Dryocopus javensis pectoralis. Black Woodpecker.—♂, May 4. Maxilla black; mandible bone color; eyes bright yellow; feet slate; stomach crammed with small winged insects like flying ants; shot at dusk in dense woods.

I saw a total of six, two pairs and two single birds, all during April and May. They were extremely wary and very difficult to approach. Twice the birds were seen around two very tall trees which had several holes in a perpendicular line such as those made by the Pileated Woodpecker (*Dryocopus pileatus*). These holes were at least 50 feet from the ground. I saw a single bird drumming on a dead stump in very dense woods.

Hirundo tahitica javanica. Pacific Swallow.—September 14. Two specimens taken along the rocky coast; neither could be sexed with certainty.

These swallows were never seen over wooded areas except during migration in October. They were found along the barren rocky coast from the time I visited that area in midsummer until the end of October. Two to four could be seen at any time flying along the coast in and around the rock formations.

On October 8, when I started my field observations at the usual time, 4:30 p.m., I saw a steady stream of these birds flying south. Those along the coast were flying about 20 feet above the water; those flying over the land were about 100 feet above the trees. During the hour and a half that I was in the field, from 20 to 40 were always visible. The flight continued at least until dark, and may have continued after dark. The wind was fairly brisk from northwest by west, and the birds were flying almost directly south. A large number of individuals must have passed over the island even during the short time I was aware of the flight. After this date I occasionally saw a few of these swallows along the coast. No specimen was collected from this flight, and the birds were not observed with binoculars; the identification is based solely upon familiarity with those seen along the coast, identified by the two specimens above.

Motacilla cinerea caspica. Gray Wagtail.—♂, October 2. Eyes and bill black; feet and legs cinnamon brown; stomach contained what appeared to be ants.

♂, October 18. Bill black; feet and legs tan; shot at dusk at the edge of dense woods; testes small.

Between October 2 and 18, I saw a single bird four times just at dusk, feeding along a bare rocky path in an open area of low brush. The two collected were feeding on bare rocky places where ants and flies had collected in large numbers. These wagtails are sleek, stately birds. Their flight is buoyant and undulating. Once or twice when alarmed, they ran over the rock and disappeared in the thick underbrush instead of flying away.

Anthus gustavi. Petchora Pipit.—♂, October 13. Eyes brown; maxilla black; mandible, legs, and feet flesh color; stomach contained ants; shot while it was walking on the ground in open woods.

This is the only bird of this species I observed. Although not previously reported from Samar, it has been widely recorded in the Philippines, including Leyte.

Coracina striata kochii. Barred Graybird.—♂, May 11. Eyes dark red; bill black; feet blackish-gray; stomach contained a green katydid; shot from the top of a dead tree near the edge of the forest.

♂, June 12. Eyes deep garnet red; stomach contained vegetable matter; testes somewhat enlarged; one of a pair that stayed very close together while working from tree to tree.

These birds were always seen in the woods in thick cover and near the tops of the trees. From May 11 until late August they were seen singly or in pairs. During this period they were silent and seldom seen—not over an average of one bird a week. The specimen taken June 12 was collected some 75 yards from a spot where I had seen a pair a few days previously. After this specimen was shot and fell to the ground, the other bird of the pair flew to its side three or four times before flying away as I approached to pick up the specimen. During this spring and early summer period, the graybirds did not appear frightened by my presence or actions, and they were never seen with other species.

In early September these birds began to appear in small flocks; and in October, flocks of as many as 100 would settle in two or three trees much like Starlings (*Sturnus vulgaris*) in the fall. During this time of the year they were often in the same trees with Coletos, Philippine Orioles, Philippine Cockatoos, and Glossy Starlings. While feeding in trees with these other species they were very noisy, sounding like a flock of Starlings, but upon the slightest disturbance they would become silent and fly off—one, two, or three at a time rather than in a general flock movement. In mid-October these large noisy flocks began to disappear rather rapidly.

Lanius cristatus lucionensis. Brown Shrike.—♀, March 26. Eyes dark brown; bill pearl-gray, somewhat purplish near base and black at the tip; feet pearl-gray; ovary slightly enlarged; taken by sling-shot in thick brush.

September 30. Two of undertermined sex, believed to be males; eyes black; feet and legs blue-gray; bills black except basal two thirds of mandible, which was ivory; stomach of one contained grasshoppers and beetles, the other grasshoppers only.

♂, October 6. Eyes brownish-black; bill shiny black except basal half of mandible, which was mother of pearl; feet and legs blue-gray; stomach contained two grasshoppers; shot while hunting from a small bush in an open area of about 2,500 square yards. Three others of this species were hunting in the same area.

October 14. One specimen, sex uncertain. Maxilla black, mandible pearl; feet slate-blue.

In the spring and summer these birds are shy and scarce; only three were seen from mid-February to mid-September, and they were quiet and elusive, inhabiting only the densest bushy areas. About the middle of September these shrikes began to appear everywhere in small noisy flocks; in October four or five could be seen within a half hour at any time of day. They hunted from dead twigs or branches about 10 feet high from which they flew to the ground and back, apparently hunting grasshoppers or other insects. Throughout the fall days they were noisy in flight and while hunting. In flight their tail feathers seemed to wave or flutter like paper streamers. The usual flock consisted of from five to eight birds, and the majority of the flocks appeared to be composed of young birds.

Artamus leucorhynchus leucorhynchus. White-bellied Wood Swallow.—Only one specimen, a juvenile of undetermined sex, was collected; it was taken July 22 from a flock of seven. At least three others in this flock were juveniles. There were three other, similar, flocks in the immediate vicinity. This is the only occasion on which I saw these birds either in or over the forest areas of the island. They were usually in palm groves or partially cleared areas. These wood swallows were among the most common birds of the island and were least disturbed by the activities at the Naval base, even nesting in the

center of the camp area. Four to six of these birds could be seen at any time, usually feeding on the wing or from perches. The perches were dead twigs or phone wires from 10 to 20 feet high; they would fly from these perches to the ground after insects from 10 to 100 feet away.

The flight of the White-bellied Wood Swallow is without parallel in grace and deftness. It is similar to the flight of the Purple Martin (*Progne subis*) and is the best exhibition of complete mastery of the art of flying that I have ever seen. At Calicoan these birds were most active in flight just before sunset. In the palm groves they soared back and forth just over the trees, riding the sea breeze with motionless wings. Often a flock of 15 or 20 would gather high in the sky at evening and for an hour or so perform aerial acrobatics. Except when they were feeding, their flight was accompanied by much twittering, which could even be heard during the high evening flights.

These birds apparently nested in May and June in the hollow tops of broken-off palm trees at heights of from 10 to 30 feet. As the palm areas where they were most numerous were cleared for warehouses, they moved into partially cleared or fairly open wooded areas. This change of habitat was fortunately after the presumed spring nesting season. They were especially attracted to areas that had been burned over.

Microscelis gularis gularis. Philippine Bulbul.—♂, May 2. Bill, eyes, and feet brown; testes enlarged.

♀, May 23. Eyes brown; bill and feet brownish-black; stomach empty; ovary moderately enlarged; one of a pair chasing noisily about in dense low brush; shot at 6:00 p.m.

These birds were very common and in flight, action, and habitat were much like our Wood Thrush (*Hylocichla mustelina*). Five to seven of these bulbuls could be seen at any time of day in thick brush, where they noisily chased one another. The voice and calls were quite varied, ranging from *cheep* and a cat-like *mew* to clear, liquid, melodious whistles. They were curious, and I could attract them by whistling or "squeaking"; then, after watching me for a moment or two, they would fly off through the woods while calling harshly and loudly.

Monticola solitaria philippensis. Blue Rock Thrush.—♂, September 18. Eyes blue-black; bill and feet black; stomach contained grape-like fruit full of seeds; wing 112; tail 70.

♂, October 7. Eyes brown; bill and feet black; wing 113; tail 76.

I never saw these birds anywhere except on the barren rocky coast. They were wary, always flushing just out of gun range and flying 50 to 75 yards farther up the coast, in and out of the rock formations. When flying toward me and on becoming aware of my presence, they would fly high or wide around me. They were extremely difficult to see, for they were usually on the bare rock, which their color perfectly matched. I sometimes saw them perched on low branches of scrub bushes or even weeds, usually within three feet of the ground. Although not previously reported from Samar, this migrant has been widely recorded from other islands in the Philippines.

The Rock Thrushes were seen from early September through October. Four to six were usually seen in three-fourths of a mile along the coast until nearly the end of October when they became much scarcer. I never heard them calling or singing.

Phylloscopus borealis. Arctic Willow Warbler.—♂, October 7. Maxilla brownish black; mandible, legs, and feet tan.

October 7. Two specimens of undetermined sex; eyes brownish-black; other soft parts as above except that one had mandible with dark tip.

The Arctic Willow Warblers appeared very suddenly and in great numbers on October 6 and 7, remaining only two or three days, although scattered individuals were seen during the following week. Their appearance was much like a wave of migrating wood warblers (Parulidae) in eastern United States. No voice or call was heard. They were seen feeding in the tree tops, the brush, and even in the sparse weeds and tufts along the coast. They seemed to feed from leaves and branches, as well as on the wing. They did not associate with any other species although they arrived with the large wave of migrants during the first week of October.

Orthotomus atrogularis frontalis. Sharpe's Taylor-bird.—♂, June 6. Eyes light brown; maxilla dark brown; mandible and feet flesh-color; testes slightly enlarged.

♂, August 30. Soft parts same as above; testes slightly enlarged.

These birds were regularly seen in the low bushes of either open or heavily wooded areas—an average of three or four per week throughout the time I was on the island. In the fall they traveled from bush to bush in small flocks of about 10 individuals. I observed such a flock on September 3 traveling with Oriental White-eyes, Philippine Flowerpeckers, and Van Hasselt's Sunbirds; the largest flock, consisting of 15 to 20 taylor-birds, was seen September 9. As these birds were always in dense low brush they were difficult to collect because they could not be seen at a sufficient distance to avoid blowing them to pieces, and it was rearly impossible to locate one after it had been shot. At no time did they appear to be disturbed by my presence; I frequently walked along with them as they slowly worked through the brush within two or three feet of me.

While working through the brush feeding, they uttered a very pleasant soft squeak and their song, heard mostly in the spring and early summer, was surprisingly clear and loud for such a frail bird.

Muscicapa griseisticta. Gray-spotted Flycatcher.—September 30. One specimen; sex not definitely determined. Eyes, feet, and bill jet black.

This specimen is my only positive identification of the Gray-spotted Flycatcher, although two birds believed to be of this species were seen during the following week. The specimen was collected while it was feeding on the wing in short flights from the limb of a dead tree in a fairly open forest area.

Rhabdornis mystacalis minor. Philippine Creeper.—♂, May 31. Eyes brown; bill and feet black. One of a pair traveling with a Pygmy Woodpecker. Testes moderately enlarged.

♂, June 22. Eyes brown; bill and feet black. Stomach empty. Testes slightly enlarged. Shot at 6:30 p.m. from the top of a tree approximately 30 feet high.

Only two other birds of this species were seen; both were single birds on dead limbs at the edge of the woods in the last of June or early July. In behavior these birds are similar to nuthatches (*Sitta*), although they seemed to spend most of their time in the crown of the trees, feeding from leaves or blossoms, rather than on the main branches. No call or song was heard.

Dicaeum papuense papuense. Philippine Flowerpecker.—April 30, May 8, May 20, June 26, July 3, August 31. Six males, all with enlarged testes except for the specimen of August 31; bills and feet black; eyes, brown (5), brownish red (1).

September 3, juv. ♂. Mandible and base of maxilla deep yellow; feet pale brownish-black.

These flowerpeckers were among the most common birds of the island, being seen singly, in pairs, and in small flocks of six or eight individuals. They were often seen traveling with white-eyes, sunbirds, and taylor-birds.

Their fast, darting flight was difficult to follow when they were chasing each other from tree to tree. During flight they were almost always twittering and from March through October they were active from dawn until dark. I have seen them hover like hummingbirds (Trochilidae) before flowers or clusters of leaves. They were usually seen in the forest or the tall trees at the edge of open areas, only rarely in low brush or bushes, never in palm groves. Their flight was usually from tree to tree but on several occasions I noted flights above the forest for a distance of one-fourth of a mile.

I am certain a nesting bird was located about May 20 some 12 feet from the ground in the thick vines covering a dead stump. For a period of two weeks I could frighten the bird from this place at any hour of the day by shaking the vines. When frightened, the bird flew about 100 feet into the woods, and when I returned about one-half hour later, it would have returned to the same place in the vines. McGregor (1909:626) notes that Bourns and Worcester reported these flowerpeckers breeding in August on Samar. Adult males collected at Calicoan on April 30, May 8 and 20, and July 3 all had much enlarged testes; the specimen of June 26 had testes about half enlarged; that of August 31 had small testes.

Dicaeum trigonostigma cinereigulare. Orange-breasted Flowerpecker.—3 ♂♂, May 11, May 14, and June 28. Eyes brown or dark brown; bills, legs, and feet black. All breeding birds; testes greatly enlarged. All shot from high perches on dead twigs of tall trees in fairly open brushy areas, singing (May 14 and June 28) in late afternoon or evening.

In addition to those collected, two or three others were seen in late May or early June, one of them in dense woods. Whitehead (Ogilvie-Grant and Whitehead, 1898:243) reported eggs found on Samar in July, while Bourns and Worcester (McGregor, 1909:633) reported the birds breeding in August.

Nectarinia sperata. Van Hasselt's Sunbird.—♂, March 18. Eyes, bill, and legs black; testes enlarged; stomach contained small flies, an ant, small spider, and a mosquito. One of a pair singing.

♂, May 30. Testes enlarged, singing from a dead twig 20 feet from the ground; chased from tree to tree for about 400 yards before collected.

♀, June 4. Eyes olive; bill and feet black; stomach contained 3 small snails and a green mosquito-like fly; ovary much enlarged.

A total of about 15 birds of this species was seen during the time I was on the island. Their actions were much like those of wood warblers, and their song was clear, loud, and very pleasing. They were often seen in the company of Yellow-breasted Sunbirds, Philippine Flowerpeckers, white-eyes, and taylor-birds, but were usually in the higher cover with flowerpeckers rather than in the lower brush that was worked by white-eyes, and taylor-birds. One large mixed flock containing at least four male sunbirds was seen traveling along the high central ridge of the island on September 3.

Zosterops palpebrosa basilanica. Oriental White-eye.—June 7. One specimen, sex undetermined; bill black, mandible gray at the base; feet pearl-gray; one of four that were singing and chasing each other in the tree tops.

♂, June 6. Eyes brownish-gray; bill gray, mandible gray at the base; feet pearl-gray; testes slightly enlarged; probably one of the four noted above.

Few white-eyes were seen, possibly a total of 15. It is probable that others were seen but not identified because of their similarity to other small birds in the area and because of the dense brush in which they were usually found. Those seen and identified were usually with taylor-birds or sunbirds in low thick brush. Their song was a clear pleasant whistle but lacked the power and distinctive notes of the sunbirds.

Aplonis panayensis. Philippine Glossy Starling.—September 9. Two juveniles of undetermined sex; eyes red; feet and bill black; shot from a flock of 12 to 15 birds.

♀, October 7. Eyes brilliant red; bill, legs, and feet black; stomach contained grape-like berries; shot from a flock of 6 to 8 birds which were working in and out of holes near the top of a high dead tree about an hour before dark.

October 14. Juvenile of undetermined sex (probably ♂) eyes red; bill and feet black.

In voice, flight, and behavior these birds are very similar to our Starlings (*Sturnus vulgaris*).

I have found no migration or local seasonal movements of this species recorded in the literature, but it is reported as a common resident throughout the islands. No birds of this species were seen on Calicoan prior to September, when juveniles appeared rather suddenly in flocks of 10 to 30 individuals. They stayed together in their own flocks; when not feeding they used high dead trees or branches for perches. When disturbed, they wheeled and flew off in a tight flock that could be broken up only by a shot. Occasionally a small flock would join a larger flock in a tree, but after a while approximately the same number that joined the first flock would fly away together. I never saw a flock consisting of both adults and juveniles, nor did I see both age groups feeding in the same area at the same time.

The adults appeared equally abruptly and in large numbers during the first week of October and, save for a few scattered individuals, disappeared in about one week. The largest concentration was on October 6, 7, and 8, when several flocks of as many as 50 birds could be seen at any time of the day. I estimated that between 300 and 500 of these adults were often feeding in the treetops in an area of about 10,000 square yards. The adults were much noisier than the juveniles. On October 14 a total of no more than 20 adults were seen, and a day or two later there were none except for an occasional pair or single bird, although a few scattered flocks of juveniles were encountered through October.

Sarcops calvus. Coleto.—♀, May 18. Eyes light brown; feet and bill black; wattles ruddy flesh-color; ovary much enlarged; stomach contained hard black seeds, pea-size; one of a pair.

♂, May 27. Eyes brown; one of five, high in a big tree.

♀, August 21. Eyes brownish-black; wattles flesh color; stomach contained 2 seeds the size of a pea; shot at 5 p.m.; ovary slightly enlarged.

These are among the most common and interesting birds of the island; usually seen in pairs or small flocks of four to eight individuals, though in the fall, flocks of as many as 50 were seen. They were active throughout the day, found in all localities except palm groves, often seen traveling with the Philippine Orioles, and feeding with them as well as Barred Graybirds, cockatoos, juvenile Philippine Glossy Starlings, and Bonaparte's Imperial Pigeons. Delacour and Mayr (1946:245) well describe the call note as "a peculiar click, metallic but not displeasing"; however their voice and calls are varied. They have a clear melodic whistle, somewhat like that of the Philippine Oriole, and were often heard mewing much like our Catbird (*Dumetella carolinensis*).

On March 10, just at dark, I saw three entering a hole in a tree some 20 feet above ground, presumably to spend the night. I noted this same procedure four or five times during the rest of the month at the same place, and three birds were always present. A pair of Philippine Orioles usually went to roost at about the same time on a branch about 15 feet from the hole used by the Coletos, and neither species seemed to pay any attention to the other. Some of the holes usually frequented by the Coletos were much like

those made by the Pileated Woodpecker (*Dryocopus pileatus*). Their flight is like that of the Grackle (*Quiscalus quiscula*), but they were often seen to alight with a nearly perpendicular upswoop of 10 to 20 feet to a branch, or directly into a hole without touching or alighting before entering. A pair was once seen taking turns flying from a hole to a tree about 100 yards away and returning to the tree. I think they were feeding on insects which were evident in great numbers on the tree.

Dicrurus hottentottus striatus. Spangled Drongo.—♂, June 28. Eyes deep reddish-brown; bill, legs and feet black; testes much enlarged; one of a pair singing in dense low growth.

♂, August 21. Eyes bluish-black; bill and feet black; testes not enlarged; stomach contained small insects.

Although usually seen in dense woods on Calicoan, these drongos came out into cleared or open areas at evening and were seen apparently catching insects on the wing, off tree trunks, or from the leaves of banana plants. At this time I have also seen them flying around a puddle much like butterflies. They would occasionally light on a tree trunk to pick off a few insects before resuming flight. At dusk they would sometimes perch on a limb about five feet from the ground or on a fallen log and give a slow series of five or six sharp whistles, each call in the series being a little higher in the tonal scale than the preceeding one. If disturbed in this activity, they would fly to a similar place about 100 feet away and continue calling.

These birds were usually seen singly or in pairs until fall, when flocks of four or five were frequently seen. They were fairly common, and two to four could be seen at any time of day during a half-hour walk in the forest. Three birds were frequently heard calling or singing in an area of one acre. They seemed particularly attracted to deep ravines or low thick bushy areas.

The song and call of these Spangled Drongos was very similar to that of our Catbird (*Dumetella carolinensis*) or Brown Thrasher (*Toxostoma rufum*), being a series of clear, loud, melodious whistles. They also *mew*ed like the Catbird.

Oriolus chinensis chinensis. Philippine Oriole.—♂, May 8. Eyes brownish-purple; bill translucent reddish-purple, darker near the base; feet slate-color; testes much enlarged; stomach contained fruit like a grape and some seeds.

♂, June 21. Eyes brownish; bill translucent flesh-color; feet blue-gray; testes slightly enlarged; stomach contained seeds and vegetable matter.

During the time that I was on the island, from 2 to 10 of these orioles could be found on any day. Prior to mid-summer they were mostly seen in pairs, while in the fall they were usually seen in small flocks. In every month they were seen frequently with Coletos, and in the fall were often seen feeding and traveling with juvenile Philippine Glossy Starlings, Barred Graybirds, and cockatoos. They were usually seen in fairly open forest or at the forest edge. They were never seen in the palm groves.

Their voice and call was much like that of that of the Cardinal (*Richmondena cardinalis*), a clear loud liquid whistle, the notes of which are unusually well suggested by the native name *tu li hi ao*. The call was easily imitated, and during the time I was on the island, one or more of these orioles were frequently decoyed by my whistles. Another call given by these birds was similar to that of the cockatoo, but not so loud nor so harsh.

The only display noted was a bowing ceremony between two birds facing each other on a dead log late in the afternoon of February 21. This ceremony was interrupted by my presence, and the birds flew off. Just at dark on several days in early spring a pair

of these orioles gathered in the same tree with three Coletos as reported above. Their movements were not particularly localized, and they were often seen to fly out of sight; only crows, hornbills, hawks, cockatoos, and pigeons seemed to range farther.

Corvus macrorhynchus philippinus. Large-billed Crow.—♂, July 9. One of a pair; testes moderately enlarged (8 mm. by 6 mm.); one of a pair, the other remaining in the immediate vicinity cawing for some time and then following me for a quarter of a mile before flying away. Wing 305, tail 216, culmen 61.

Crows were regularly seen during the entire time I was stationed on the island. Although there was no variation in the overall numbers seen daily, there was a local concentration of some 20 to 25 birds at a point on the shore where garbage was being dumped into the sea.

In flight and general behavior these birds were like the North American Crow (*Corvus brachyrhynchos*). They ate garbage and carrion along the roadside. They chased and were chased by other birds, including Bonaparte's Imperial Pigeons and Serpent Eagles. They were usually seen in pairs or small flocks of 5 or 6, but would gather quickly in larger flocks to chase a hawk while cawing loudly. The maximum chase after a hawk was not over a quarter of a mile. They were not much disturbed by men or automobiles but were careful to move a bit away (out of gun range) and return to their carrion or former perch as soon as one had passed.

As there are two species of crows reported from Samar it is unfortunate that I did not identify or collect the smaller one, *Corvus enca.* It is especially unfortunate that a crow was not taken while giving the very uncrowlike call noted by previous observers. Two entirely different calls were made by the crows on Calicoan, the first was the usual deep gutteral *caw caw* too well known to require comment. The other call was a loud, piercing shriek or whistle heard daily from March to mid-July, usually at dawn or just at dark in the evening. I have heard both calls from crows in the same tree. I was never able to see any difference in size or behavior of the crows seen. I actually heard one, apparently no different from *Corvus macrorhynchus,* give this piercing whistle as it flew directly over me and well within gun range, but I didn't have time to shoot before it had passed and disappeared in the forest.

For a few days during the last week of June, four crows spent the night in a palm tree near our tents, although they usually were seen roosting in the tall trees in the dense growth along the high central ridge of the island. They usually roosted in small groups of 5 to 7 birds but occasionally in the spring birds roosted alone. Throughout the time of my observations, a daily regular northward flight up the center of the island was seen. This flight consistently had peaks of 35 birds visible at one time, at 4:45 p.m. and again at 5:45 p.m. The time of these flights was so regular that I had no need to consult a watch to gauge my field time properly so as not to miss dinner. They were, perhaps, flying to a communal roost but I never saw them returning in a regular flight. I never heard these birds give the piercing call during this evening flight.

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Route 5, Huntington, New York, March 1, 1953

NEW LIFE MEMBER

Stuart Houston, born on September 26, 1927, received his M.D. from the University of Manitoba in 1951. His interest in ornithology developed and grew with the founding (in 1942) and growth of the Yorkton Natural History Society, in Yorkton, Saskatchewan where he makes his home. He is now president of this society and also of the Saskatchewan Natural History Society, and a contributor to "The Blue Jay," the official bulletin of the latter organization. The photo, taken during the Christmas bird count at Dilke, Saskatchewan, in 1951, shows Dr. Houston wearing buffalo coat and moccasins, clothing appropriate to the 28° below zero weather of that day. His interest in birds has led him to band over 6200 individuals of 83 species.

THE ANALYSIS OF BIRD SONGS BY MEANS OF A VIBRALYZER

BY DONALD J. BORROR AND CARL R. REESE

TO analyze a bird's song one needs to determine its loudness, rhythm, and frequencies. Since these characteristics cannot be accurately determined by the ear alone, most published accounts of bird songs are merely subjective descriptions and not accurate analyses. Attempts have been made (*e.g.*, Arleton, 1949, and Mathews, 1904) to represent bird songs with the musical scale, but these are often inadequate because they cannot accurately indicate the unusual intervals, slurs, or erratic rhythms in many songs, and they do not indicate the frequency composition of the individual notes. Saunders (1935 and 1951) has devised a graphic method of representing bird songs, showing time on the horizontal axis and pitch on the vertical axis, and while his graphs are useful for identification they do not always show the minute details of rhythm, and no attempt is made to show frequency composition except by an accompanying description indicating the quality and phonetics of the song. Brand (1935) introduced a new method of bird song analysis—the microscopic study of songs reproduced on sound film. This method makes possible the accurate determination of the minute details of rhythm and the frequencies of the fundamentals, but it does not give any information on the harmonics or other frequencies present. A few other means have been used (*e.g.*, Metfessel, 1934, and Fish, 1953) to obtain graphic analyses of bird songs, and while some of these give an accurate picture of the rhythms they do not give frequency composition, a feature that determines the quality of a note. The determination of loudness in all these analyses has been entirely subjective. In this paper the authors wish to report briefly on a method of bird song graphing that has been little used (Bailey, 1950), one which not only gives a picture of the minute details of rhythm but shows all the frequencies present and gives some data on loudness.

Two types of graphs, or vibragrams, can be obtained with the Vibralyzer (manufactured by the Kay Electric Company, Pine Brook, New Jersey). One type shows frequencies along the vertical axis and time along the horizontal axis, and variations in intensity appear as corresponding variations in the darkness of the mark produced. A second type (a "section" vibragram) shows frequencies on the vertical axis and intensity on the horizontal axis, for any given point (actually integrated over 0.005 sec.) in time; this type gives more accurate data on intensities than the first type. Vibragrams are made on 5⅝ by 12¾ inch facsimile paper; frequencies are portrayed over a vertical distance of about 4 inches and time over a horizontal distance of about 12½ inches. This paper is fastened to a drum which rotates synchronously with a magnetic disc; the stylus is a 10 mil stainless steel wire. The marks on the paper are made electrically.

A simplified diagram of the principal circuits of the Vibralyzer is shown in Fig. 1. The input signal (from a tape recording of the song) is recorded on a magnetic disc (with the switch S_1 in the "record" position) by means of a record amplifier; once the

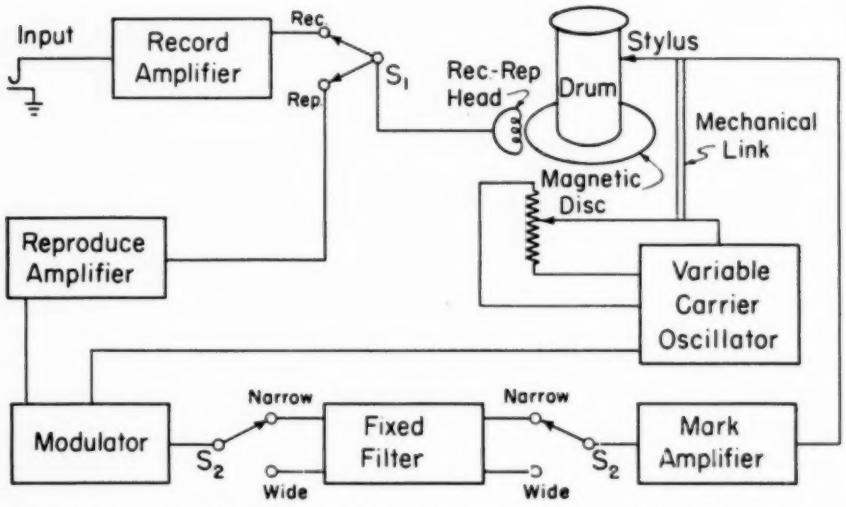

FIG. 1. A simplified diagram of the principal circuits of the Vibralyzer; several circuits are omitted, including the monitor amplifier, the erase head on the magnetic disc, and the sectioner.

signal is on the disc, S_1 is turned to the "reproduce" position. The signal on the disc may be heard by means of a monitor amplifier (not shown in the diagram) each time the disc rotates. When the vibragram is made the disc is rotated at the rate of 80 revolutions per minute and the signal is played back from the disc by means of a reproduce amplifier, and the output of this amplifier is fed into a modulator which modulates the playback signal with the output of a variable carrier oscillator. The frequency of this oscillator is determined by the position of the stylus, by means of a mechanical linkage. The modulated signal is fed to a fixed frequency filter, and the output of the filter actuates the mark amplifier which in turn supplies a marking voltage to the stylus. As the vibragram is made the stylus moves upward on the drum one inch for every 96 revolutions of the drum, causing the oscillator to sweep through its frequency range and thus effectively scan the recorded signal over this range. The frequency of the oscillator at any given position of the stylus determines what frequencies in the recorded signal will give rise to a difference frequency* that passes through the filter and results in a mark by the stylus.

The filter is set for a frequency of 15,000, and the carrier oscillator frequencies vary from 15,133 to 28,300; thus the reproduced frequency range is from 133 to 13,300 cps. The frequency range covered in any given vibragram depends upon the speed of rotation of the magnetic disc when the signal is being put on it; this disc can be rotated at four

*If one sine wave, $e_1 = E_1 \sin 2\Pi f_1$, modulates a second sine wave, $e_2 = E_2 \sin 2\Pi f_2$, the resultant signal (e) can be represented by $e = E_2 \sin 2\Pi f_2 + E_1 \cos 2\Pi (f_2 - f_1) - E_1 \cos 2\Pi (f_2 + f_1)$. The second term in this value of e gives rise to the difference frequency, $f_2 - f_1$. This difference frequency, due to the proper selection of parameters in the Vibralyzer, is the only frequency in the resultant signal which falls within the range of the analyzing filter.

TABLE 1

FREQUENCY RANGE, RESOLUTION, AND RECORD DURATION OF VIBRAGRAMS MADE OF SIGNALS PUT ON THE MAGNETIC DISC AT DIFFERENT DISC SPEEDS

Speed of disc when signal is put on	*Frequency range of vibragram**	*Effective band width of filter*		*Duration of sample*
		Narrow	*Wide*	
Lowest	5–500 cps	2 cps	20 cps	20 sec.
Low	15–1500 cps	6 cps	60 cps	6.6 sec.
High†	44–4400 cps	20 cps	200 cps	2.25 sec.
Highest	133–13300 cps	60 cps	600 cps	0.75 sec.

* The range can be reduced to one-half this value by a switch on the control panel.
† Most bird songs are fed to the Vibralyzer with the disc rotating at this speed.

different speeds. Two band widths are available in the filter, a wide band and a narrow band. The degree of time and frequency resolution of the vibragram depends on the disc speed (when the signal is put on it) and the band width of the filter, the narrow band filter giving greater frequency resolution and the wide band filter giving greater time resolution. The characteristics of vibragrams made under different conditions are shown in Table I.

Vibragrams of any given song will vary in appearance depending on the settings on the control panel of the instrument; the controls can be set to bring out specific characteristics of the song. Time intervals can be measured with greater accuracy if the tape recordings fed into the Vibralyzer are run at a reduced tape speed.

The following general conclusions may be drawn from the few hundred vibragrams of bird songs that we have made to date:

(1) Relatively few bird notes are simple or "pure"; most of them are composed of many frequencies, and the most intense frequency is seldom the lowest in the note. Few notes show distinct harmonics. Most bird notes, except those that are clear whistles, are somewhat intermediate between musical tones and noises, *i.e.*, they may contain two or three predominating frequencies but also contain all (or nearly all) of the frequencies in between. If the frequency spread is narrow (*e.g.*, the second note in the Red-eyed Towhee song, Fig. 3), the note appears musical; if the frequency spread is an octave or so (*e.g.*, the lower notes of the Song Sparrow's trill, Fig. 6), the note appears more like a noise. The frequency of a musical note can be determined fairly accurately by ear by comparison with a standard, but it is difficult or impossible to determine any predominant frequency by ear in a noise-like note.

(2) Some birds may begin a note with a particular frequency composition, and before ending that note begin another containing a different (usually higher) group of frequencies (see Figs. 2 and 3).

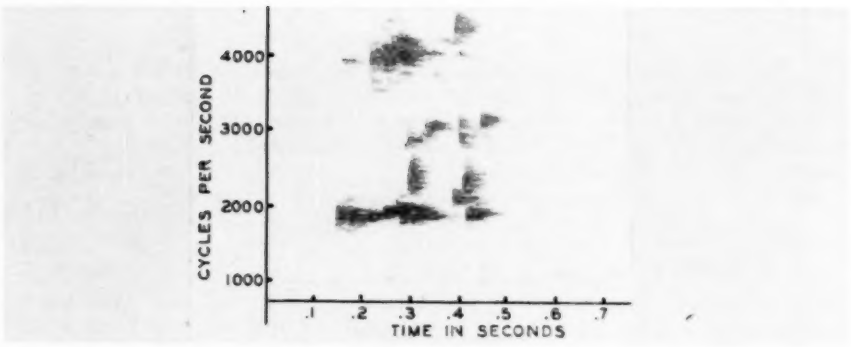

Fig. 2

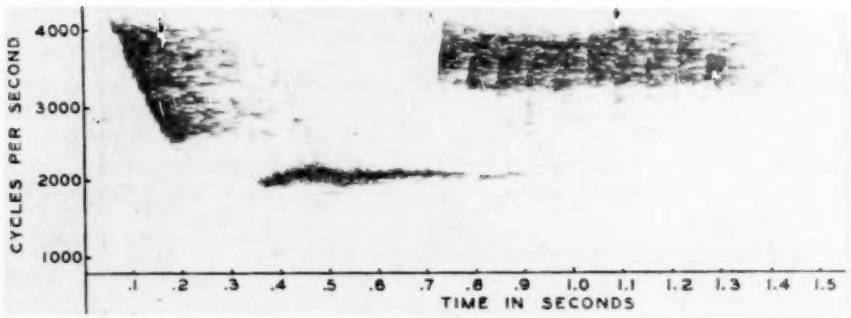

Fig. 3

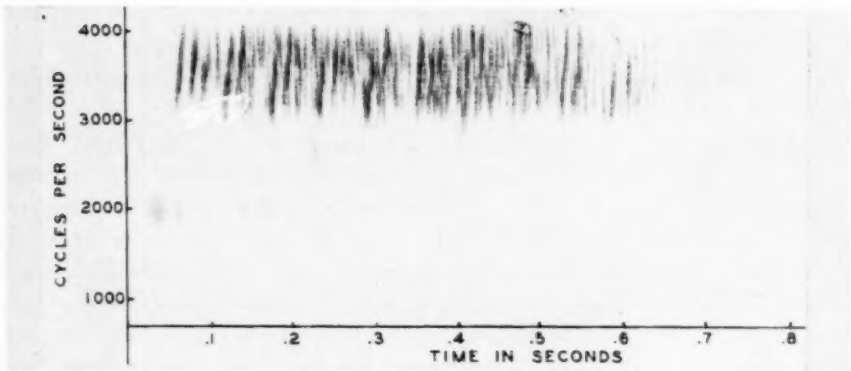

Fig. 4

FIGS. 2–4 (top to bottom). Vibragrams of bird songs, from tape recordings made in central Ohio. Fig. 2, the somewhat squeaky "song" of the Blue Jay (*Cyanocitta cristata*); Fig. 3, the *drink-your-tee* song of the Red-eyed Towhee (*Pipilo erythrophthalmus*); Fig. 4, the final *teeee* of the same song shown in Fig. 3, made to give better time resolution and showing the pulses in this note. The vibragram in Fig. 4 was made using the wide band filter; the other vibragrams were made using the narrow band filter.

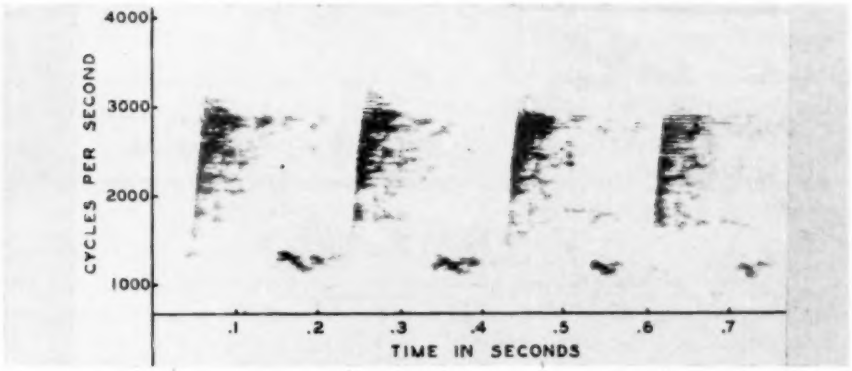

Fig. 5

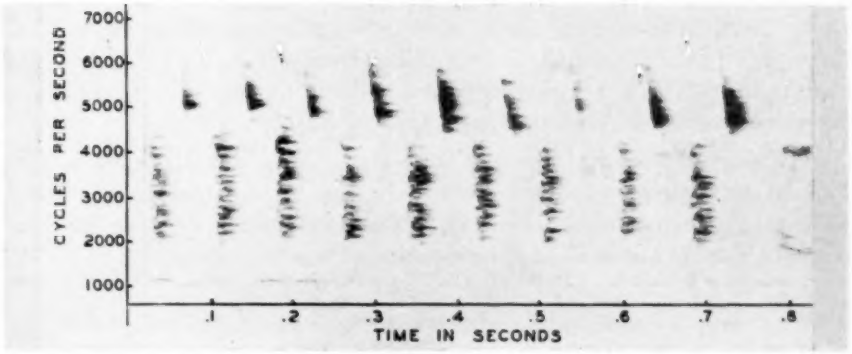

Fig. 6

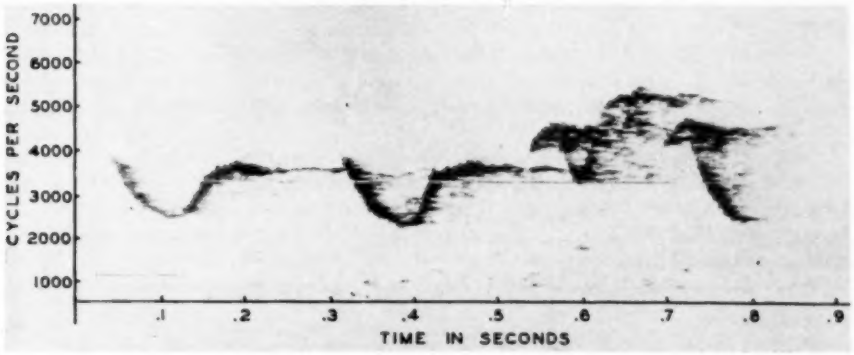

Fig. 7

FIGS. 5–7 (top to bottom). Vibragrams of bird songs, from tape recordings made in central Ohio. Fig. 5, part of the song of a Cardinal (*Richmondena cardinalis*); Fig. 6, a trill in the song of a Song Sparrow (*Melospiza melodia*); Fig. 7, the song of a Hooded Warbler (*Wilsonia citrina*). These vibragrams were made using the narrow band filter.

(3) Many bird notes are slurred upward (*e.g.*, Fig. 5) or downward an octave or so in 0.01 second or less.

(4) Notes which appear buzzy to the ear (*e.g.*, the final *teeee* of the towhee's song, Fig. 4) usually contain a wide range of frequencies and are modulated, with pulses coming at the rate of 100 or more a second.

(5) Many bird songs contain more individual notes than are apparent to the ear (note particularly Fig. 2).

(6) Some bird notes (*e.g.*, the final note in the Hooded Warbler's song, Fig. 7) consist of two groups of frequencies, one maintained steady and the other slurred; or, such a bird might be said to sing two notes at once, one a steady note and the other slurred.

Analyses of this sort will provide objective data that are more detailed and accurate than those obtained by most of the methods heretofore used in studying bird songs, and should be of value in behavior and taxonomic studies. They suggest some interesting lines of future investigation, *e.g.*, a study of the intraspecific variation in bird song, and a study of the syringeal mechanism to determine how these vocal gymnastics are produced.

We wish to express our appreciation to Dr. J. Allen Hynek, Department of Physics and Astronomy, Ohio State University, for making a Vibralyzer available for these studies, and to Mr. William Protheroe, of the same department, for his assistance in the operation of the Vibralyzer.

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Department of Zoology and Entomology, The Ohio State University, Columbus 11, Ohio, February 11, 1953

GENERAL NOTES

The Carolina Chickadee in Kansas.— W. A. Lunk (1952. *Wilson Bull.*, 64:7-21), in an interesting and useful paper on variation in the Carolina Chickadee (*Parus carolinensis*), has described a new form, *P. c. atricapilloides*, ranging from Kansas through Oklahoma to central Texas. Among the Kansas records, two listed from Douglas County aroused the curiosity of Wetmore, long familiar with that area through his undergraduate days at the University of Kansas at Lawrence. The Black-capped Chickadee (*Parus atricapillus*) is common there, but the other species, except for this record, has never been reported. On inquiry, Lunk kindly indicated that the two skins concerned were at the University of Oklahoma, allegedly having been collected by Charles D. Bunker on September 10, 1898.

Sutton examined the two specimens, comparing them and their labels with all specimens of *P. carolinensis* and *P. atricapillus* in the collection, and consulting all available catalogues. Deciding, finally, that Wetmore, who knew Bunker and his methods well, should see all specimens of comparable locality, date, or catalogue number, Sutton sent a series of seven to Washington. With this material in hand, Wetmore decided that the two moot birds had been wrongly labelled through some clerical error.

Bunker was associated with the University Museum at Norman for a period. He not only collected at numerous localities in Oklahoma, but also took a small number of specimens near his home at Lawrence, Douglas County, Kansas, during this connection. It was his practice to use small tags marked only with a number in the field, and to prepare labels with complete data on locality, date, and other details later. In some way these two Carolina Chickadees, which bore only field numbers, must have become confused with certain Lawrence specimens, and so were wrongly attributed to that locality.

The mixup becomes the more evident through direct comparison of the two moot birds with a specimen of Black-capped Chickadee that it appears was actually taken by Bunker at Lawrence on September 10, 1898. The "make" of this Black-cap and the type of its field label differ decidedly from the "make" and field label of the two Carolinas. The field number of the Black-cap is 89, of the other two 324 and 325 respectively. Obviously the three birds are not of the same series. It seems probable that the two Carolinas were taken not in Kansas, but in Oklahoma, and by another collector, and that they were labelled wrongly through some confusion later, when permanent labels were prepared.

The northern limit of *P.c. atricapilloides* in Kansas is not, therefore, Douglas County, but Meade, Greenwood, and Montgomery counties, instead, and range statements concerning the form should so read.—Alexander Wetmore and George Miksch Sutton, *Smithsonian Institution, Washington, D.C. and Museum of Zoology, University of Oklahoma, Norman, May 4, 1953.*

Nesting of the White-throated Sparrow in West Virginia.—A considerable southward extension of the known breeding range of this species, *Zonotrichia albicollis*, is worthy of record. The A.O.U. Check-List of 1931 gives the most southerly localities of its nesting as the mountains of northeast Pennsylvania and New York. Todd ("Birds of Western Pennsylvania") suspected it of nesting in the northwest corner of that state but had no records.

On June 18, 1952, while leading a group of young nature students from Oglebay Institute through the bog formed in the valley at the headwaters of White-oak Spring Run, four and a half miles northeast of Terra Alta, West Virginia, Buchanan flushed a bird of this species from its nest containing three eggs. A fourth egg was subsequently laid. The bird was seen well by Buchanan and others in the group, and the nest and eggs were typical for the species. On June 19, while further exploring the swamp, the group found another nest. This nest contained two eggs of the White-throat (one dented), one of the Cowbird, and the shell of another White-throat's egg lay on the ground beneath. The female was flushed and was well seen by several of the group.

The first nest was placed 18 inches above the ground, supported by a small rhododendron bush which was thickly grown over with dead as well as green growth of fringed sedge (*Carex crinata* Lam.), the sedge forming a screened canopy over the nest. It was well constructed of coarse sedge stems ("straw") and a few grass blades, and lined with fine grass stems. No leaves were used in the construction. The location was in the intermittent shade of hemlock and maple trees as well as that of rhododendron and alder that grew in the bog. Some spruce was present not far distant. The second nest was of similar construction though in a little more open situation. It was also placed 18 inches above the ground, supported on a leaning dead shrub of shrubby St. Johns-wort, and a leaf of skunk cabbage partially shaded the nest.

On June 22, Ganier, Buchanan and others returned to the site and again identified the first bird as it flushed five feet away. The nest was photographed *in situ* (see illustration), and in view of the importance of the find, the nest and eggs were collected for future reference. The eggs average a little smaller (measurements in inches: .81 × .60, .80 × .60, .80 × .57, and .82 × .56; average, .81 × .58) than those described by various authors, and are beautifully marked. The account of Davie (1898. "Nests and Eggs of North American Birds") describes the eggs quite accurately and is here quoted: ". . . ground color . . . pale greenish-blue, spotted, sprinkled and clouded with cinnamon-rufous and bay." The second nest mentioned was found to have been deserted.

On June 17, we had found good evidence of the nesting of this species about three and a half miles to the northeast, in the more extensive Pine Swamp bog at Cranesville in Maryland. We there found White-throats at two locations without making any

special search for them. One pair, discovered by George Breiding of Wheeling, West Virginia, seemed much disturbed by our presence and evidently had a nest close by. Ganier sat for half an hour while the birds flew uneasily about in nearby trees and shrubs, keeping 30 to 50 feet away, but they were not seen to go to the nest. The thick, knee-high marsh grass all about made a thorough search impossible in the time available. Maurice Brooks has written us that he and Carl Haller saw a male in this swamp on June 3, 1936, and felt at the time that the White-throat might eventually be found nesting in the West Virginia mountains. However, none were found in the high, mountainous area around Davis, Tucker county, about 25 miles south, in a week-long census by The Brooks Bird Club, June 9–17, 1951 (127 species recorded).

Barrows (1912. "Michigan Bird Life") states that in Michigan, all nests of which he had record were built on the ground. The elevated nests described in this paper may have been the result of occasional floodings of the bog by the stream which drains the valley.—ALBERT F. GANIER, *2112 Woodlawn Drive, Nashville, Tennessee, and* FOREST W. BUCHANAN, *Amsterdam, Ohio, September 17, 1952.*

Unintentional live-trap for American Mergansers.— On June 20, 1950, my wife and I arrived at a camp situated in the Winnipeg River just north of the Lake-of-the-Woods and six miles south of Minaki, which is only a few miles from the western border of the province of Ontario. Minaki is a small settlement and trading post on the Canadian National Railroad. The camp is situated on a wooded island of about two acres in extent, and there are half a dozen cabins scattered about it. Beneath an ice house on the island we found a nest with ten eggs of the American Merganser (*Mergus merganser*).

The morning after our arrival we found a female American Merganser in a mess hall adjacent to our living cabin. The bird had entered through the chimney during the previous night and we permitted it to escape. This experience was repeated on three successive mornings and in each instance the bird was unharmed and permitted to go free.

On the second day of our encampment there we visited a neighboring island a half mile distant where there was a single, large, unoccupied cabin with no open entrance revealed by subsequent, careful search except for the chimney. On the floor of the cabin were eleven female American Mergansers, all except two of which were dead. The two were permitted to escape by the door as we entered. They all had entered the cabin by way of the chimney and fireplace, and the nine apparently had died of starvation. After this experience we took pains to cover the chimney of this cabin, as well as the others at our encampment, with chicken wire held in place by stones of suitable weight. We subsequently learned from natives of the region that covering chimneys was a common practice, as female mergansers had a habit of entering unoccupied cabins in the spring.

During our stay of ten days we saw a great many American Mergansers, but we did not discover a natural nesting site. There were few large trees; and, because of the very high water, fully ten feet above normal, most of the short stumps were covered. This condition may have contributed to the behavior of the birds. Undoubtedly they were seeking nesting sites when they entered the cabin chimneys.

It should be added that in June, 1951, we revisited this region. The water was much lower on this occasion, and the behavior of the mergansers was not repeated. We did find a nest with a clutch of eggs under the ice house on this occasion, just as we had previously.—WILLIAM D. DUGAN, *221 Pierce Avenue, Hamburg, New York, January 27, 1953.*

Casting of a Pileated Woodpecker.—On February 2, 1952, in a forest of hemlock and hardwood trees on Green Hill, Mahwah, Bergen County, New Jersey, we flushed an adult male Pileated Woodpecker (*Dryocopus pileatus*) from a dead hemlock tree where he had been chiseling characteristic wedge-shaped holes. The ground beneath was covered with fresh chips. On top of the chips and close to the tree was a fecal casting of the bird.

The casting resembled that of a chicken (*Gallus*). It was composed of a paper-like sheath encasing a solid mass of chitinous material. The sheath was light greenish with traces of dark green. Inside, the chitinous matter, apparently mouth and leg parts of ants, resembled tobacco. The casting was 3 to 3½ inches long and 5/16 inches in diameter. The diameter was easy to measure but the length difficult because the casting broke when I attempted to measure it. After the casting dried out, the paper-like sheath became whitish in color.

I sent the casting to Dr. Marion R. Smith, of the U. S. National Museum, Washington, D. C., for examination. The following is his reply: "The casting of the pileated woodpecker appears to contain, exclusively, fragments of workers of the black carpenter ant, *Camponotus pennsylvanicus* (*Degeer*). It is impossible to estimate definitely the number of workers contained in the casting, but I believe a conservative guess would be a hundred more or less. The carpenter ant, as you may know, is a wood nesting form with variable sized workers. Some of the workers are very large and it would not take the fragments of many of these workers to give the appearance of more individuals involved than there really are."

A few days later I revisited the place and retrieved another short piece (about an inch) of the casting which I knew had fallen into the chips on the first visit. This piece would raise the number of ants in the casting about one-third.—Eleanor E. (Mrs. John Y.) Dater, *Ramsey, New Jersey, November 20, 1952.*

Five nestings of a pair of captive Mourning Doves.—A pair of Mourning Doves (*Zenaidura macroura*) kept at the Ornithology Laboratory at Ohio State University during the summer of 1951 made five nesting attempts which are shown below.

Nesting Attempt	Eggs Laid	Hatched	Fledged
1.	2 (early in April)		Deserted
2.	1 no date	May 1	May 12
3.	1 May 15	May 30	Both, June 14
	1 May 16	May 31	
4.	1 June 18	July 2	July 12
	1 June 19	July 4	July 15
5.	1 July 18	Aug. 2	Both, Aug. 14
	1 July 19	Aug. 3	

The birds were confined in a pen 6 feet × 9 feet × 6 feet. The nest used for the entire period was a small watering crock located in a three-sided covered box. Except for some brief interchanges the male incubated from about 7:00 a.m. till 5:00 p.m. and the female stayed on the nest at night. The young of one nest were fed by the male at least until both eggs of the next clutch were laid. A careful check on egg laying times was not kept but both eggs of set No. 4 were laid in the afternoon, one at 5:40 p.m., the other between 5:30 p.m. and 7:00 p.m.—L. S. Putnam and C. E. Knoder, *Dept. of Zoology and Entomology, Ohio State University, Columbus, Ohio, May 20, 1953.*

EDITORIAL

President Breckenridge has appointed committee chairmen, to serve during the year 1953–1954, as follows: *Library*, George J. Wallace; *Research Grant*, Ernst Mayr; *Endowment*, Charles H. Rogers; *Membership*, Ralph M. Edeburn; *Conservation*, William H. Marshall; and *Local Committee on Arrangements for the 1954 meeting at Cape May*, Phillips B. Street.

Other 1953–1954 appointees are: *W.O.C. representative on the American Ornithologists' Union Council, meeting at Los Angeles*, R. Allyn Moser; *W.O.C. delegate to the 1954 International Congress at Basel, Switzerland*, Olin Sewall Pettingill, Jr.; and *Investing Trustee*, Phillips B. Street, to succeed A. W. Schorger, whose term has expired.

THE LOUIS AGASSIZ FUERTES RESEARCH GRANT

It will again be possible in 1954 to make the award of a Louis Agassiz Fuertes Research Grant, thanks to the generosity of an anonymous donor. Applications for this grant of $100 and inquiries about it should be directed to the chairman of the Research Committee, Prof. E. Mayr, Museum of Comparative Zoology, Cambridge 38, Massachusetts. Any member of the Club or one of the Affiliated Societies will be eligible. Applications, which should state the qualifications and the need of the applicant as well as details of the planned research project, must be received as soon as possible so that the award can be made at the June meeting.

The Membership Committee would like to be able to report to the Cape May meeting in June that the membership roster contains 2000 names. This will require an increase of 212 members beyond the total for December, 1952. Each member probably knows of one or more persons who would profit by association with us. It is up to you, the membership, to invite such persons to join the Wilson Club, and to turn in their names to the Membership Committee, using for this purpose the nomination forms which accompanied dues notices. We, as a committee, have no other way of obtaining many of these names. Last year's nominations brought in about 50 new members, a very profitable effort. May we have your continued support? Send the nomination forms to the Treasurer, or to any one of the Membership Committee listed below:

Ralph M. Edeburn, Chairman, Marshall College, Huntington, W. Va.
Mrs. Herbert E. Carnes, 25 Kenwood Road, Tenafly, N. J.
Ben B. Coffey, Jr., 672 N. Belvedere, Memphis 7, Tenn.
Robert C. Conn, 769 Park Avenue, Bound Brook, N. J.
Alfred E. Eynon, 5 Beach Road, Verona, N. J.
G. E. Grube, Gettysburg College, Gettysburg, Pa.
Harold D. Mitchell, 378 Cresmont Avenue, Buffalo 14, N. Y.
C. Chandler Ross, 7924 Lincoln Drive, Chestnut Hill, Philadelphia 18, Pa.
Edward L. Seeber, Laboratory of Ornithology, Cornell University, Ithaca, N. Y.
George M. Sutton, Department of Zoology, Univ. of Oklahoma, Norman, Okla.
T. G. Watson, 4110 Drummond Street, Houston 25, Texas.

ORNITHOLOGICAL LITERATURE

OUR AMAZING BIRDS. By Robert S. Lemmon. American Garden Guild and Doubleday & Company, Inc., Garden City, New York, 1952: 7 × 10 in., 239 pp., 102 black and white text-figs. and pls. $3.95.

This attractive work can hardly fail to teach the lay reader a great deal about birds, and to impress him with some of "the little-known facts about their private lives." Based on the not-unreasonable premise that facts about almost *any* bird are "little-known" and "amazing," it presents much basic and interesting life-history information, in easily readable form and embellished with numerous fine illustrations. The latter were done by Don Eckelberry, who according to the foreword had also a considerable part in the selection and preparation of text material.

While each of the 102 one- to two-page accounts treats a single North American species, or occasionally a small group, there has been a commendable effort to include comments of broader taxonomic and geographic application. The selected representatives of about 51 families include some rare and spectacular (and even extinct) birds, as well as some of the most commonplace. There is no semblance of systematic arrangement, and scientific names have properly been almost entirely omitted. The breezy, colloquial style is highly anthropomorphic, and laden with superlatives and glowing comparisons. It is sometimes refreshing, sometimes tiresome, and occasionally not altogether lucid ("The brown creeper belongs to a very small bird family . . . But it is not at all embarrassed by loneliness."). Some errors of fact are apparent. The male Tree Swallow, for example, ordinarily does *not* incubate; and "all true woodpeckers" do *not* "live primarily" on food gathered by "banging away with chisel-pointed bills until they have hammered a hole." The illustration showing a male hummingbird hovering solicitously beside the nest, while not impossible, at once strikes a false note.

Eckelberry's wash drawings are unquestionably the main attraction for the ornithologist. As is frequently the case, the best of the smaller text figures have more freshness and life than some of the more ambitious plates; but with few exceptions they range from good to superb. Throughout the series the artist's originality and excellent draftsmanship are apparent. We are looking up from below at the kingfisher, and down from above at the robin, and the Blue Jay is facing almost directly away; there are few conventional profiles. In almost every case the portrayal of forms and attitudes is impressively convincing. The backgrounds, employing a wide variety of treatments, are excellent, except for occasional lapses, as in the case of the branch which to my eye persists in making the Winter Wren appear several times as large as it should.

I noticed only one typographical error. The format of the book is neat and modern throughout, the paper and print very good, and the brief index adequate for its purpose.—WILLIAM A. LUNK.

THE YELLOW WAGTAIL. By Stuart Smith. Collins, St. James Place, London, 1950: 5½ × 7¾ in., xiv + 178 pp., 26 paintings, 11 black and white photographs, 4 line drawings, 4 maps. 12s. 6d.

This is one of the excellent "New Naturalist Monographs." Based on seven years' study it discusses *Motacilla flava* in general and particular as may be judged from the table of contents: the bird and its breeding distribution; winter quarters and migrations; territory, pair-formation and aggressive display; nuptial display; the nest; the clutch; the brood; the final phase; the story of a name; the Yellow Wagtail group.

This bird prefers water-meadows as a rule, but certain colonies nest in heather and on moor-lands. The life history story is given in leisurely manner with description of typical events and comparisons with other species. No birds appear to have been banded, but plumage differences facilitated recognition of individuals. The birds immediately distinguish each other's sex through the respective coloration.

Wagtails are highly social birds outside of the nesting season, but decidedly territorial after being joined by mates. Territorial display and fighting are described and vividly portrayed in paintings by Edward Bradbury. The male's initial displays to his mate are simple affairs but later become spectacular with hovering over the mate and a song flight. "During this fluttering descent, the cock sings with a musical trill, 'sree-sree-sree', very rapidly repeated, which is a beautiful and musically refined edition of the normal call notes" (p. 45). "There are, however, very few people who appear to have heard the true song of the Yellow Wagtail."

The female chooses the nest site and builds the nest, yet the male helps incubate. Incubation lasted 12 to 13 days; the young left at 12 to 13 days and were able to fly at 16 days. A very high rate of success was found in the 19 nests watched, only three nests coming to grief. From 99 eggs 66 young were raised, or 66.6 per cent. Strangely enough Dr. Smith states that baby wagtails are not fed nor do they defecate until "the second day after the hatch," (p. 76) *i.e.*, when they are about 24 hours old (p. 81). The author assumes a 40 per cent survival of adult birds and 25 per cent of young that left the nest. From my experience with Song Sparrows, *Melospiza melodia* I would consider 50 per cent survival of adults and 20 per cent survival of young a better estimate for many small birds. Where only 38 per cent of returns of adults are reported I suspect that some survivors were missed.

It is surprising to read in regard to "starvation in winter or death from a predator" that "it is fairly certain that the number of small birds which die from such causes is trivial compared with those struck down by the unseen army of parasites which infest the bodies of birds" (p. 147). The author does not discuss the intriguing problem of why the wagtail wags his tail. There is an index and a 21-page bibliography, besides appendices that give details of breeding distribution in Europe and Britain and list the parasites of wagtails. The paintings and photographs add much to the attractiveness of this interesting book.—MARGARET M. NICE.

THE REDSTART. By John Buxton. Collins, St. James Place, London, 1950: 5½ × 8 in., xii + 180 pp., one color photograph, 19 black and white photographs, 20 maps and diagrams. 12s. 6d.

It was a pleasure to read John Buxton's fine monograph, "The Redstart," and become acquainted with this European thrush, *Phoenicurus p. phoenicurus*. Although the author disclaims credit for describing behavior of all Redstarts, the thoroughness of his observations and his keen awareness of the ornithological literature are apparent throughout the book. He studied Redstarts in Britain, Norway, and during the five years that he was a prisoner of war (World War II) in Germany. Most of his studies were concentrated on a small number of birds, particularly four pairs. For one pair a mass of notes covering 850 hours of observation by the author, with the help of camp comrades, was accumulated in April, May and June, 1941, in Germany.

The book conveys the subtle joy that the author experienced in this study and his appreciation of Redstart individuality. He deplores a fact that is true of many migrants—that specimens are brought back from their winter homes frequently enough, but no information on the habits of the living birds there accompanies the skins.

Full song by the male, usually from low perches, starting early in April when the bird is taking territory, is continued vigorously after the arrival of the female, especially when he is enticing her to the nest hole which is always selected by the male. As soon as the female starts building, song suddenly ceases, but is resumed when the nest is complete and reaches its peak during the incubation period. Song ceases when the young hatch, not to be resumed unless there is another nest. Some individuals mimic other species.

The cock makes several types of display. In courtship pursuits, wings and tail are spread widely, the latter depressed. In a post-coition display, he makes circular flights around the hen, uttering excited calls. All Redstarts have a peculiar mannerism of "shivering" the bright chestnut tail in a rapid up-and-down motion which the author believes has definite functions.

During courtship, to interest the female in the nest site, there are three types of enticement display, which occur in the following order of frequency: (1) Entering box or hole, flashing white frontal patch at entrance. (2) Entering box, flying out a few inches, and back in at once without alighting. Both displays are made in silence. (3) Gliding down to box from a branch, singing in flight, wings and tail spread.

Nests are built by the female in cavities between rocks, in rock walls, trees, or in nest-boxes in open areas at varying heights, and sometimes on the ground. Incubation is also done by the female and starts with the laying of the last egg. The light blue eggs, usually unmarked, hatch in 12 to 14 days. The male flies to the nest often, presumably to see if the eggs are hatched. The pair cooperates in feeding the young, which leave the nest on the 15th or 16th day and are dependent for about three weeks longer.

The Redstart is a short-lived bird; more than three-quarters die within their first year. The oldest known lived six years.

Chapter 9 is devoted to migration; Chapter 10 to history and distribution; Chapter 11 to taxonomy. These are followed by a Select Bibliography which gives page numbers of the references cited. The text of the book is not interrupted by their inclusion.

Appendices provide distributional maps and banding recoveries.

A beautiful color photograph by Eric Hosking shows a male Redstart at the nest cavity.—AMELIA R. LASKEY.

EDITOR OF THE WILSON BULLETIN

HARRISON B. TORDOFF
Museum of Natural History
University of Kansas
Lawrence, Kansas

ASSOCIATE EDITORS

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ROBERT M. MENGEL

ILLUSTRATIONS EDITOR

WILLIAM A. LUNK

SUGGESTIONS TO AUTHORS

Manuscripts intended for publication in *The Wilson Bulletin* should be neatly typewritten, double-spaced, and on one side only of good quality white paper. Tables should be typed on separate sheets. Before preparing these, carefully consider whether the material is best presented in tabular form. Where the value of quantitative data can be enhanced by use of appropriate statistical methods, these should be used. Follow the A. O. U. Check-List (fourth edition) and supplements thereto insofar as scientific names of United States and Canadian birds are concerned unless a satisfactory explanation is offered for doing otherwise. Use species names (binomials) unless specimens have actually been handled and subspecifically identified. Summaries of major papers should be brief but quotable. Where fewer than five papers are cited, the citations may be included in the text. All citations in "General Notes" should be included in the text. Follow carefully the style used in this issue in listing the literature cited. Photographs for illustrations should be sharp, have good contrast, and be on glossy paper. Submit prints unmounted and attach to each a brief but adequate legend. Do not write heavily on the backs of photographs. Diagrams and line drawings should be in black ink and their lettering large enough to permit reduction. The Illustrations Committee will prepare drawings, following authors' directions, at a charge of $1 an hour, the money to go into the color-plate fund. Authors are requested to return proof promptly. Extensive alterations in copy after the type has been set must be charged to the author.

A WORD TO MEMBERS

The Wilson Bulletin is not as large as we want it to be. It will become larger as funds for publication increase. The Club loses money, and the size of the *Bulletin* is cut down accordingly, each time a member fails to pay dues and is put on the 'suspended list.' Postage is used in notifying the publisher of this suspension. More postage is used in notifying the member and urging him to pay his dues. When he does finally pay he must be reinstated on the mailing list and there is a publisher's charge for this service. The *Bulletin* will become larger if members will make a point of paying their dues promptly.

NOTICE OF CHANGE OF ADDRESS

If your address changes, notify the Club immediately. Send your complete new address to the Treasurer, Leonard C. Brecher, 1900 Spring Drive, Louisville 5, Kentucky. He in turn will notify the publisher and editor.

THIRTY-FIFTH ANNUAL MEETING

of the

WILSON ORNITHOLOGICAL CLUB

CAPE MAY, NEW JERSEY

FRIDAY, JUNE 11, TO MONDAY, JUNE 14

Sponsored by

Delaware Valley Ornithological Club

Urner Ornithological Club

New Jersey Audubon Society

Plan now to attend this eastern seaboard meeting to be held in an area as widely known ornithologically as any in the United States.